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## *THE PROCEEDINGS AT THE CENTENARY OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA*

AN adequate celebration of the one hundredth anniversary of the academy was urged by the academy secretary early in February, 1911, and was entrusted to a general committee of forty-three. The celebration thus provided for extended over three days: the 19th, 20th and 21st of March. It began on the 19th because that was the stated meeting night of the academy, the 21st being the actual date of the anniversary. The lecture hall on the evening of the 19th was well filled with people, the front seats being occupied by delegates, who, to the number of one hundred and forty-seven, had been appointed by corresponding societies at home and abroad.

The president of the academy, the Honorable Samuel Gibson Dixon, M.D., LL.D., took the chair promptly at 8 P.M., and introduced the Honorable Rudolph Blankenburg, mayor of Philadelphia, who, in a few well-chosen words, cordially welcomed the visiting scientists to the city. The recording secretary, Edward J. Nolan, M.D., then requested the delegates, as the names of the societies they represented were called by the corresponding secretary, J. Percy Moore, Ph.D., to arise, bow, and hand their letters of credential and congratulation to the president without reading. As the exercises of the evening were likely to be lengthy, he asked that any remarks considered desirable should be very brief. Thus warned, as a matter of fact, no one spoke, and as much the greater number of the two hundred and eighty-six letters received from all parts of the world

had been already delivered by mail, this otherwise tedious part of the program was not unduly prolonged.

The president then delivered his historical address as follows:

ADDRESS OF THE PRESIDENT

*Fellow Members and Guests:* This is one of the occasions which stimulate reflection. To-day we must all feel a regret that we can not inherit the learning of those who have gone before us. So keen an appreciation do I possess of the unselfish devotion of my predecessors to science and to this institution, and so impressed am I at our monthly meetings in our reading room by the regard of their portraits hanging on our walls, that I am impelled to call upon them in spirit to join me in extending to our guests the heartiest of welcome and to say that we, the present workers, fully appreciate how much credit is due them for our present success.

To-day this City of Brotherly Love, with the mother commonwealth, Pennsylvania, in common with the great union of states, is in peace with all the nations of the globe. This blessed condition did not prevail on the day when our forefathers assembled one hundred years ago, to organize an institution for the study and advancement of the natural sciences. During the last days of the year 1811, the dispute between the United States and Great Britain and the doubt as to the attitude of France seemed to indicate that the national honor was hurt and that another contest with a European power was at hand. The commerce of the country had suffered. The Committee on Foreign Relations recited the wrongs that the United States had suffered from Great Britain, and declared it to be the sacred duty of Congress to call forth the patriotism and resources of the country. Extensive military measures were recommended. The Pennsylvania Legislature passed acts for enlarging the regiment of artillery and for the organization of the cavalry of the city of Philadelphia. Although war was not declared until June, 1812, in anticipation of the necessities of the situation Congress approved a loan of eleven million dollars, of which one million six hundred and forty-five thousand dollars was raised in Philadelphia.

Large meetings of people took place all over the city to consider the needs of commercial interests and to pass resolutions for the equipment of privateers and for building up the defenses of the city.

The legislature relieved the tension of its patriotic resolutions by requesting a special committee to examine a machine made by Charles Redhefer, who claimed that it possessed the power of self motion, and naïvely stated that "if the machine be found to be imperfect the public interest will be promoted by exposing its fallacy."

In the midst of these excitements the youth of the city naturally sought the taverns and oyster cellars as meeting places, as indeed there was little in the way of diversion provided for the people of that period. The theater was seldom opened, and the feeling against it was so strong that a petition was presented to the legislature requesting it to abolish forever the exhibition of "Theatricles." Peale's Museum enjoyed great popularity, and here the lusus natura was in steady demand. The calf with five legs vied for public favor with the child without ears.

Notwithstanding the preparations for war which were draining the resources of all men, the fathers of this institution had such faith in the future of the United States of America that they did not hesitate, even with the din of martial demonstrations in their ears and the consciousness of an awful, impending struggle with

gigantic powers in their minds, to proceed quietly, methodically and unperturbed to found an association for pure learning which has now become one of the foremost among the scientific institutions of the world.

The vibrations, whose echoes still resound in this Hall of Science, though the voices that started them can no longer be heard, are too numerous to be mentioned on this occasion, when there is so much that is new to be brought out within the short time allotted for our assemblage for the last time in the academy's first century.

This institution was born of the enthusiasm of earnest lovers of science. They had before them a single purpose, the unveiling of the laws of nature and the engraving of them on the tablets of the society that they might be studied by men of all nations. To accomplish this great end as the society grew they realized the necessity of exploration, of collections, of laboratories, of a library and of reciprocity with bodies having similar aims.

In the beginning of the nineteenth century a few young men in this city spent their spare time in studying natural history. They soon learned it was to their mutual interest to meet to compare notes. In the year 1812 John Speakman and Jacob Gilliams agreed that it would be well to hold regular meetings; accordingly, they, with Drs. Gerard Troost, Jr., Nicholas S. Parmentier, Camillus Macmahon Mann and John Shinn, Jr., met at the home of one of their members on the northwest corner of Market and 2d Streets, on January 25, 1812. The minutes of this meeting set forth that their meetings would be for the rational disposition of their leisure moments. Their next meeting was held at a public house on Market Street near Franklin Place on the 21st day of March, 1812, at which time Dr. Samuel Jackson, of the University of Pennsylvania, suggested the title of The Academy of Natural Sciences. The collection of the society at this time was represented by a few common insects, a few corals and shells, a dried toad fish and a stuffed monkey.

Thus established, the academy, with its constantly increasing resources, has been for one hundred years free for the use of all students of natural history.

The masters of science have come from all parts of the world to consult the great zoological, botanical, geological and ethnological collections which the accumulated labors of our members, during a century of activity, have brought together in our museum.

Writers and students of all grades have come to consult the wonderful natural-history library which the liberality of our members and the world-wide exchange of our own publications have enabled us to gather on our shelves.

Pupils from our schools have come under the guidance of their teachers to study and profit by the exhibits displayed in our public museum halls, while our specialists have delivered courses of popular lectures on the natural sciences under the auspices of the academy and the Ludwick Institute.

In every way within its power the academy has stood for a century as the advocate of the study of the natural sciences, advanced or elementary, pure or applied.

And this, our one hundredth anniversary, is a particularly happy birthday because our precious natural history library of volumes unexcelled in America, and our priceless collections of mammals, birds, reptiles, fishes, shells, insects, plants, ethnological and geological specimens unsurpassed in several of the departments and all of them rich in the type specimens of the early naturalists of America, having been for almost one hundred years exposed

to the danger of damage or destruction from fire, are now, through the intelligent liberality of the commonwealth of Pennsylvania, placed in a thoroughly fire-proof building.

The society has, however, never received state or city financial aid for maintenance, but has depended entirely upon the liberality of intelligent people, mainly of Philadelphia, to contribute the necessary funds to purchase land for our buildings, to publish the results of the scientific researches of our members, to fit out expeditions and of late years to pay meager salaries to the members of our scientific staff.

While we have thus built up fine study collections, it has been impossible to develop the popular exhibits that other sister institutions, rich in state and municipal appropriations, have been enabled to instal.

We have, however, kept our collections systematically arranged and have, during the last decade, had the satisfaction of seeing all our historical types and the numerous recent accessions placed in metal cases, impervious to light, dust or moth; which will insure them the longest possible life.

Our honorary corresponding membership now numbers about two hundred, composed of the greatest scientists of the period.

Biographical sketches of our officers and scientific workers who carried us through the last one hundred years are printed in our publications, and as we have so little time before us they can only be casually alluded to in this brief résumé of the academy's history. We are, however, proud of the escutcheon upon which the history of their lives is engraved.

Members of this academy have taken a very prominent part in explorations. Thomas Say was a member of the "Long Expedition" to the Rocky Mountains in 1819 and 1820 and was one of the first scientific men to become personally acquainted with the vast natural history resources of the great west.

Nuttall and Townsend, thirty years after the Lewis and Clark expedition, crossed the continent to the mouth of the Columbia River, and then extended their explorations to the Hawaiian Islands, returning around the Horn. They brought home rarities of animal and plant life, many of which were unknown to science. These collections were placed in the academy's museum, then the chief repository for natural-history specimens in America and here they are still preserved.

When the United States government was organizing the famous Wilkes expedition of 1838, the academy was requested to nominate its scientific staff and two of its members eventually accompanied the party.

In the year 1850 one of our members, Edward Harris, financed and accompanied the great Audubon expedition up the Missouri River. Through his modesty, we were prevented at the time from making known the important part that he took in this expedition. Other members made possible the exploration of Duchaillu in equatorial Africa.

We provided Dr. Kane with his outfit for systematic collecting in 1853 when he made his Arctic expedition. To-day we have in our collection his famous Esquimau dog, "Toodla," as well as numerous other specimens obtained by him. Specially interesting is the gigantic stuffed polar bear which stands in interesting contrast to the modern mounted specimen brought here by the Peary "relief expedition."

The Hayes expedition to the far north a few years later was also aided and endorsed by the academy.

Rear Admiral Peary, discouraged by his futile attempts to interest other institutions and governments in his proposed voyage of exploration to the north, came to us

with his proposition. He was generously received and a committee was appointed to arrange the expedition, which sailed on June 6, 1891, from Brooklyn, under the auspices of the academy, to explore the Arctic regions. On January 26, 1892, we authorized a relief expedition under the command of Professor Heilprin. On September 24, 1892, we officially met the relief expedition sailing up the Delaware River on the now historic vessel *Kite*.

Dr. Hayden, a member of the academy, when conducting the United States Geological Survey in the west, made up his scientific parties largely from our membership. The setting apart of the great national Yellowstone Park resulted from his numerous explorations. Every three years this institution bestows upon a distinguished geologist a gold medal called the Hayden Medal, an award which was founded by Dr. Hayden's widow.

The Pennsylvania Geological Surveys were also conducted by our academy members, Rogers and Lesley.

Our famous colleagues, Leidy and Cope, were the pioneers in describing the extinct animals from the wonderful deposits of the western states.

I may mention among the more recent expeditions the one under Professor Heilprin to Yucatan and Mexico in 1890, the Harrison and Hiller expedition to Sumatra, the numerous explorations of Mr. Clarence B. Moore, the Rhoads expeditions to British Columbia, Colorado and Ecuador, the Donaldson-Smith expedition to Somali-Land and Lake Rudolph, and the Bond expedition to Venezuela, from all of which we have received rich returns.

The academy publications had early a world-wide reputation. For many years they furnished the only adequate means through which American scientists reached the naturalists of the world. Contributions for publication came from all parts of America. To-day our *Proceedings* and *Journal* are exchanged with all the nations of the civilized world. It may be interesting to state here the fact that when the famous Pacific railroad surveys were made the United States government published descriptions of all the new specimens it obtained in the academy *Proceedings*.

Passing rapidly over the more important departments of our museum, we find among mammals a number of the specimens obtained by Townsend in the far west, made known to science in our *Journal* by our correspondents Audubon and Bachman; the Harrison Allen collection of bats, the Rhoads collection of North American mammals and the splendid collection of anthropoid apes presented by Dr. Thomas Biddle.

Our collection of birds will ever stand as a memorial to two of our members, Thomas B. Wilson and John Cassin. To Dr. Wilson's liberality we owe the acquirement of the famous Rivoli collection, the Gould collection and many others. His entire gift, comprising some 25,000 specimens, was regarded in 1850 as the finest collection in the world. Cassin spent his life in the study of this vast collection and his researches published in our *Proceedings* made our academy famous as an ornithological center, while he himself stood preeminent among the ornithologists of America.

The part that the academy played in the development of ornithology in America may be appreciated by the mere mention of those who worked within its walls or published the results of their researches in the *Proceedings*—Nuttall, Bonaparte, Townsend, Gambel, Heermann, Harris and Woodhouse, among our members, and Baird, Lawrence, Henry and Coues, among our correspondents.

In our vast series of reptiles, we find the material collected and studied by Hallowell,

Cope and Brown—names inseparable from the history of herpetology in America.

In the study of fishes at the academy the names of Bonaparte and Cope, already mentioned in other connections, stand forth prominently and their collections are still carefully preserved. Charles Lesueur, one of our earliest members, also attained fame as an ichthyologist, while of late years several of those who studied at the academy have become famous in the service of the United States Fish Commission—notably John Adam Ryder.

As regards mollusks, the academy has from its foundation taken a prominent part and has accumulated a collection probably second to none. A series of investigators, eminent in their special field, have made the society one of the world centers in the study of mollusks.

Almost a century ago Thomas Say blazed the trail for conchologists, while Dr. Isaac Lea and T. A. Conrad were his successors in the academy in this department. Lea's work, largely published by the academy, is the basis of all later systematic study of fresh-water mussels, while to Conrad we owe the foundation of American tertiary geology and paleontology, his work in this line overshadowing that on the living mollusca. Gabb was another famous worker in the same field, while to Geo. W. Tryon we owe the conception of the "Manual of Conchology," begun by him in 1878 and continued by the academy after his death in 1888. Very few works have led to so many reforms in classification or have such a broad influence as this. Dr. Joseph Leidy, who may be termed the Cuvier of America, should be mentioned in this connection because of his work forming the first volume of Binney's "Terrestrial Mollusks of the United States," published in 1851. This was the first American work on the morphology of the soft parts of our mollusks.

Thomas Say, already referred to as a pioneer conchologist, is also known as the father of American entomology. Owing to his energy, the academy's collection in this department was begun—a collection which by steady growth has reached a total of a million specimens and has become of world-wide renown. The long list of entomologists who have contributed to its development contains most of those whose activities constitute the earlier history of entomology in America.

Titian R. Peale, Wilson, LeConte, Horn, McCook, Cresson, Martindale and others have made our entomological department one of the first importance. The Cresson collection of hymenoptera has made the academy the greatest in America in this particular branch. The Bassett collection of galls and gall insects is the most comprehensive ever brought together.

In paleontology the names of Leidy and Cope are preeminent. The "Extinct Fauna of Dakota and Nebraska," published by Dr. Leidy in our *Journal,* is a classic. Students of paleontology still come to consult the types of his descriptions, most of which are preserved in our collection.

Professor Cope's part in the development of American paleontology is too well known to require detailed mention and was carried on side by side with his studies of reptiles and fishes, in which his reputation was equally great. On his death-bed he placed the finishing touches to his report on the pleistocene remains discovered at Port Kennedy, Pennsylvania, a paper which attracted the attention of the paleontological world and which appeared in the *Journal* of the academy soon after his death.

In botanical research the academy has always held an important place and its herbarium, now numbering some 900,000

specimens, contains the types of such pioneers as Nuttall, Pursh, Muhlenberg and de Schweinitz besides comprehensive collections from all parts of the globe. Among those whose researches have been carried on at the academy may be mentioned, in addition to the above, Durand, Charles E. Smith, Meehan and Redfield.

In anthropology the work of Morton and later of Harrison Allen is famous. The splendid collection of human crania brought together by the former is historic. Archeological and ethnological collections comprise the material gathered by S. S. Haldeman in North America and the land of the Aztecs, Mayas and Incas.

We have also the Wm. S. Vaux collection, rich in specimens of the neolithic age of Europe, the Robert H. Lamborn collection and the Clarence B. Moore collection.

This latter represents the results of more than twenty years' exploration in the southern United States and consists of thousands of specimens of the vanished art-industries of our southern aborigines now saved for all time in our museum and in the fine series of reports published in our *Journal*.

We have extensive mineral collections, foremost among which is the Wm. S. Vaux collection, famous for the beauty of its specimens and the completeness of the series.

There are the famous Febiger collection of diatoms and others, which lack of time forces me to pass over.

So, too, there are many former members of our academy who by their scientific attainments or their loyal and generous support have helped to build up the institution, while among our living members are men who are, by their work and devotion, fully as deserving of notice as those who have gone before.

Helmholtz, in 1862, said:

> In fact men of science form, as it were, an organized army, laboring on behalf of the whole nation, and generally under its direction and at its expense, to augment the stock of such knowledge as may serve to promote industrial enterprise, to increase wealth, to adorn life, to improve political and social relations and to further the moral development of individual citizens. After the immediate practical results of their work we forbear to inquire; that we leave to the uninstructed. We are convinced that whatever contributes to the knowledge of the forces of nature or the powers of the human mind is worth cherishing, and may, in its own due time, bear practical fruits, very often where we should least have expected it.

It has been truly said that the distinctive feature of pure science is "that it is not remunerative; the practical rewards and returns are not the immediate ends in view." The work of Tyndall and Pasteur, however, on fermentation, pursued in the beginning purely because of its abstract scientific interest, later came to have enormous economic importance and led to the scientific investigations that have within recent years become of incalculable value to mankind.

The knowledge gathered by the abstract naturalist and the tabulation of scientific data concerning all forms of animal and vegetable life have a very close and direct relation to public health and preventive medicine. A long list of diseases might be compiled in which some of the insects are directly responsible for the transmission of the bacterium or parasite life causing disease. It is now a matter of almost universal knowledge that malarial fever is transmitted from man to man by means of the *Anopheles* mosquito, that the yellow fever virus can only be transmitted by the *Stegomyia calopus,* that the bubonic plague may be transmitted from man to man or from rat to man by means of the rat flea (*Pulex cheopis*), that the *Trypanosoma gambiense* of African sleeping sickness can be transmitted only by means of the tsetse-

fly, that the organism causing human filiariasis is transmitted by the *Culex fatigans* and certain of the *Anopheles*, and evidence is gradually accumulating that the germ of leprosy is transmitted by the bed-bug (*Cimex lectularius*). A knowledge of the natural history of these insects is absolutely essential for the scientific study of the diseases with which they are so closely associated, and public health work has only been effective in eradicating these diseases in proportion to the efforts of the sanitarian directed toward their destruction or toward protecting individuals from them. The entomologist, the zoologist and the bacteriologist are each required to contribute their share in the research that means so much to public health and to mankind. If much has already been accomplished, still greater are the fields open for scientific investigation.

With the lower forms of animal life parasitic to man and known to cause disease, the connecting link, the intermediate host, the full life history is missing in many instances where it would seem that the most fertile field for the scientist has not yet been invaded. A very large field lies open for those who will undertake a careful study of the relation between the vermes and the human being. Much indeed has been learned about parasites inhabiting the intestinal canal, but the parasitologist has not yet concluded the final analysis of the life history of many of these parasites.

The work of the academy has been so distinctly pure science that the lay public have not until recently appreciated the great practical relationship it has to health and economics. The description of the various species, their life history, their geographical range, have enabled those working in applied sciences to conduct the already successful war against the enemies to man, to the lower animals and to plant life.

Economic entomology, based upon abstract work, shows an annual money loss occasioned by insects as follows:

| | |
|---|---|
| Cereals | $300,000,000 |
| Hay and forage | 66,500,000 |
| Cotton | 85,000,000 |
| Tobacco | 10,000,000 |
| Truck crops | 150,000,000 |
| Sugars | 9,500,000 |
| Fruits | 30,000,000 |
| Farm forests | 11,000,000 |
| Miscellaneous crops | 10,000,000 |
| Animal products | 300,000,000 |
| Natural forests and forest products | 100,000,000 |
| Products in storage | 200,000,000 |
| Total | $1,272,000,000 |

Let it be remembered that in 1793 half the population of Philadelphia either died from yellow fever or voluntarily exiled themselves to escape from the scourge, that all the southern tier of states were kept in a state of constant terror every summer for fear of its invasion, causing a loss of millions to the commerce of the country, and then recall the fact that through entomological and medical cooperation this disease was practically eliminated from Cuba, its breeding place for ages, and that in 1905 a violent epidemic of the same plague was actually checked in New Orleans by the practical application of the knowledge gleaned by the medical department of our army in Cuba.

That mysterious blight to human life and energy, known as malaria, to which, as much as to the fire and sword of northern barbarians Greece and Rome owed their downfall, has been traced to its entomological source so that these two devastating diseases have ceased to be a menace to civilized communities, allowing that great work, the construction of the Panama Canal, heretofore impossible owing to their prevalence, to go on uninterruptedly under

conditions of unparalleled health, that the sacrifice of 5,000 American troops during the Spanish-American war was finally found to have been due to the transmission of bacillus typhosus by the common house fly, and that this knowledge was so judiciously applied by our army surgeons that a recent considerable mobilization of our soldiers was entirely exempt from that disease, and some faint conception will be reached of the immense debt that humanity owes to the patient workers in the field of pure science.

President George Washington, in his first message to Congress, said:

> Nor am I less persuaded that you will agree with me in the opinion that there is nothing more deserving your patronage than the promotion of science and laboratories, knowing in every country it is the surest basis of public happiness, one in which the measures of the government receive their impressions so immediately from the sense of the community as ours it is proportionately essential.

The mass of congratulatory letters with their autographs of our foreign co-workers received from the great institutions of the world relating to this our one hundredth birthday, can not be read, owing to a lack of time.

Before closing I have a pleasant duty to perform in behalf of the Building Committee. At the request of those entrusted with planning and erecting the building improvements, made possible by the commonwealth of Pennsylvania, as chairman of said committee, I hand over to the corporate body, under the title of The Academy of Natural Sciences of Philadelphia, this building completed for its use, which comprises fire-proof stacks for its library, a reading room, lecture hall and work room. In the rhythmic language of another, I reverently invoke the blessings of the God of Nature upon this temple of the natural sciences.

Great God of nature, let these halls
  The hidden things of earth make plain;
Let knowledge trumpet forth her calls,
  And wisdom speak, but not in vain.

Help us to read with humble mind,
  Thy larger scriptures day by day—
True bread of life! O be thou kind,
  If, erring, we should go astray.

For deep resounding unto deep,
  Declares the wonders of thy plan;
Life struggling from its crystal sleep
  Finds glorious goal at last in man.

The mysteries of the eternal laws,
  Are but the shadows of thy might.
God, ruling all in final cause,
  Enshrines the world in love and light!

*—Harvey Watts*

At the conclusion of the address it was explained that the routine of a stated meeting would then go on, in the belief that an illustration of the formula by means of which the academy had transacted its business for one hundred years would be of interest to those familiar with the results which made it worth while to hold the celebration on which they were entering.

At the call of the chair the recording secretary read the minutes of the last meeting, and also the minute of the first recording secretary, Dr. Camillus Macmahon Mann, an exiled Irishman, defining the date of the foundation of the society. The latter is as follows:

> Year of the United States the 37th,
> March 21st.
>
> In committee agreed: The year of the Institution shall commence at the present natural evolution: the spring equinox, 21st of March and the year shall be named according to the era of the United States of America in the principle city of which we assemble.

Additions to the museum and library were announced.

The corresponding secretary reported on the letters received.

The report of the council, confined almost entirely to a consideration of the ar-

rangements for the celebration, was read.

The publication committee reported the titles of papers presented for publication since the last meeting, and also announced the details of works to be issued in connection with the centenary celebration: a quarto volume of memoirs, an index to the entire series of the *Proceedings* and *Journal,* and a detailed history of the academy by the recording secretary, which will make a volume of not less than 400 pages and to which the "Short History" contributed to the Philadelphia Founders' Week Memorial Volume may be regarded as a prodromus.

The chair reported the death that morning of Thomas Harrison Montgomery, Ph.D., the director of the zoological department of the University of Pennsylvania. The occurrence supplied a pathetic note to the proceedings, as Dr. Montgomery had been deeply interested in the arrangements for the celebration, had been assigned a place on the program of exercises, and had contributed the first paper, under the title "Human Spermatogenesis, Spermatocytes and Spermiogenesis" to the commemorative quarto volume.

At the place where "verbal communications" are usually called for, Dr. Nolan, under the title "Reminiscences," spoke of his connection with the academy as assistant librarian, librarian and recording secretary during the past fifty years, his earliest record of accessions to the library being dated February 4, 1862. He deeply regretted that he had not taken advantage of his acquaintanceship with certain contemporaries of the founders, who were still alive when he entered on the scene, such as George Ord, Jacob Peirce, Isaac Hays and Titian R. Peale to make notes of their recollections of the early days, but it could readily be believed that in his most sanguine moments he had never contemplated the possibility of being called on fifty years later to record his regret before such an audience. He then spoke of the beginning of his work as an untrained assistant in the library and the unvarying kindness and consideration he had experienced from all the men met with at that time, but especially from his dear chief, J. Dickinson Sergeant, and his beloved future preceptor, Joseph Leidy.

It was an extraordinary epoch in the history of the academy, the beginning of its second half century, and the boy was associated with a stimulating group of men, including Leidy, Cope, Conrad, Tryon, Lea, Slack, Rand, Cassin, Heermann, Meigs, Gabb and Wilson, all men of marked individuality, some of whom have made permanent records as leaders of science in America.

Continuing, Dr. Nolan gave his impressions of some of his contemporaries of later date—Allen, Horn, Meehan, Ruschenberger, Ryder, McCook, Heilprin, Chapman, Isaac Jones Wistar and Arthur Erwin Brown—not by any means dealing in laudation exclusively, but indulging in kindly personalities in a belief that a more intimate tone than would be entirely desirable in a published record would not be disagreeable to his auditors, many of whom were familiar with the work of the men whom he was describing.

In the one hundred years of the academy's history four men had stood out prominently, with, of course, scores of associates, as dominant in its material and intellectual advancement. These were Thomas Say, Samuel George Morton, Joseph Leidy and the present chief executive. The work of Say, Morton and Leidy formed part of the history of the academy, and if impression were desired of the accomplishments of Samuel Gibson Dixon they had but to look around them.

Closing his remarks the secretary was

distressed to remember the names of the many dear friends whom, for lack of time, he was forced to leave in the undesirable class "and others."

Those whom he had known during the first years of association with the academy were nearly all dead. The old building, if it still existed, would be full of ghosts and even in the present halls, in the dusk of the winter days, dear shades encountered him in the alcoves and passageways and reminded him of the time when he too should be a tradition.

In conclusion he remarked:

> But in the meantime it is with feelings of profound gratitude that I bear testimony to the kindly patience and sustaining encouragement of those who are still with me and who impart to the performance of the daily task much pleasure and little or no pain.
>
> For obvious reasons I can not deal in personalities in the case of my living contemporaries, but I am at liberty to say that they are worthily taking the place of those who have labored so loyally for the advancement of the academy and who, we are not forbidden by the highest reason to hope, are now rejoicing in this splendid commemoration of their labors. Had they lived when men cherished the same truths under different formulæ their motto would have been *Ad majorem Dei gloriam*.
>
> May the men who come after us be as zealous and as disinterested in the development of truth as those whom I have been so ineffectually remembering to-night, so that when the second centenary is celebrated it also may be the subject of congratulation for a like gathering of kindly and appreciative friends.

Nominations for membership were read, the elections of those formerly proposed being deferred until the next meeting.

The rough minutes were then read for criticism and approval, as had been the custom for nearly one hundred years, the secretary explaining that he had complied with the directions of Dr. Mann and dated the record as having been made in the 137th Year of the United States. No corrections being called for, they were adopted as read and the meeting adjourned until the following morning at 10 o'clock.

Wednesday morning, March 20. The day was sparkling, bright and genial and the hall was filled with delegates, members and visitors when Dr. Dixon dropped the gavel at 10 o'clock. The following papers, most of which were résumés of communications presented for publication in the commemorative volume, were then read:

Edwin G. Conklin, Ph.D.: "Experimental Studies on Nuclear and Cell Division."

Carlotta J. Maury, Ph.D.: "A Contribution to the Paleontology of Trinidad." The memoir will be illustrated with superb drawings of fossils from the accomplished pen of Professor Gilbert D. Harris, of Cornell University.

W. J. Holland, Ph.D.: "David Alter, the First Discoverer of Spectrum Analysis," with exhibition of the prism used by him.

John W. Harshberger, Ph.D.: "The Vegetation of the Banana Holes of Florida," well illustrated by lantern views.

Frederick W. True, M.S., LL.D.: "A New Species of *Delphinodon*."

Henry H. Donaldson, Sc.D., Ph.D.: "The History and Zoological Position of the Albino Rat."

Edward B. Meigs, M.D.: "The Ash of Smooth Muscle."

Marshall Avery Howe, Ph.D.: "Reef-building and Land-forming Seaweeds," illustrated by views and specimens.

At the conclusion of Dr. Howe's paper the audience adjourned to the new geological hall—the old library hall transformed—where a liberal luncheon was enjoyed.

The meeting reassembled at 2:30 P.M., when Benjamin Smith Lyman read a paper on "Natural History Morality." It was followed by the following:

Jacques Loeb, M.D., Ph.D.: "Experiments on Adaptation of Animals to Higher Temperatures."

Henry Skinner, M.D., Sc.D.: "Mimicry in Butterflies."

Spencer Trotter, M.D.: "The Faunal Divisions of Eastern North America in Relation to Vegetation."

T. Wayland Vaughan, Ph.D.: "Rate of Growth of Stony Corals," illustrated with lantern slides.

Henry A. Pilsbry, Sc.D.: "On the Tropical Element in the Molluscan Fauna of Florida."

The session closed with illustrations by means of a superb collection of lantern views, of methods of bird photography by William L. Baily.

In the evening a reception was tendered the delegates by Dr. Dixon, Mrs. Dixon and Miss Dixon in the Bellevue-Stratford Hotel. In common with everything else on the program it was brilliantly successful.

The weather Thursday morning was a violent and most undesirable change from that of the day before, a fall of snow being driven along by penetrating winds. It was a most gratifying evidence of the earnestness and interest of those attending the sessions that little falling off in the attendance was observable when Dr. Dixon called the meeting to order a few minutes after ten.

He opened the proceedings by referring to the death of Dr. Montgomery, who had been placed first on the program of that session. His place was taken by Edwin J. Houston, Ph.D., who made an interesting communication on "How the Natural Sciences can be made Attractive to the Young."

In continuation the following papers were read:

James A. G. Rehn: "The Orthopteran Inhabitants of the Sonoran Creosote Bush."

Merkel H. Jacobs, Ph.D.: "Physiological Characters of Species."

Henry F. Osborn, LL.D.: "Tetraplasy, or Law of the Four Inseparable Factors."

George Howard Parker, Sc.D.: "Sensory Appropriation as Illustrated by the Organs of Taste in Vertebrates."

John M. Macfarlane, Sc.D.: "The Relation of Protoplasm to its Environment."

William H. Dall, A.M., Sc.D.: "Mollusk Fauna of Northwest America."

The time having arrived for luncheon, two papers were deferred to an afternoon session not provided for on the printed program.

On reassembling at 2 o'clock, Henry G. Bryant, LL.B., read a paper on "Governmental Agencies in the Advancement of Geographical Knowledge in the United States," and the scientific sessions concluded with a superbly illustrated and most interesting lecture by Witmer Stone, A.M., the ornithological curator of the academy, on the "Fauna and Flora of the New Jersey Pine Barrens." The communication was specially enjoyed by those from a distance as imparting in a most pleasing manner information regarding a region of quite unusual physiographical interest.

The rest of the afternoon was devoted to a demonstration of the resources of the museum and library, including a fine display of one hundred and thirty-two microscopes and an exhibition of a portion of the academy's superb collection of butterflies.

In the evening one hundred and sixty members and guests sat down to a banquet in the exquisitely decorated new geological hall, formerly occupied by the library. The occasion will long be remembered as a specially enjoyable one by those present.

Dr. Edwin G. Conklin, professor of biology in Princeton University and one of the vice-presidents of the academy, was an inimitable toastmaster and at his call appreciative speeches were made by the mayor, who sat on the right of the president; Mons. Jean de Pulligny, director of the commission of French engineers to the United States; Dr. Henry Fairfield Osborn, president of the American Museum of Natural History, New York; Dr. Dixon; Dr. Theodore N. Gill, of the Smithsonian Institution; Dr. William J. Holland, of the Carnegie Museum of Pittsburgh, and Dr. Nolan, all bearing testimony to the acad-

emy's influence as a source of inspiration and encouragement.

The celebration of the one hundredth anniversary of the institution which had produced such a marked effect on the progress of science in America finished with the singing of "Auld Lang Syne," the departing guests sympathizing with those who were unable to participate in the hearty and genial conclusion of a program which was unanimously declared to be a complete success.

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### *THE MISUSE OF LANTERN ILLUSTRATIONS BY MUSEUM LECTURERS*[1]

THE illustrated lecture has long been a very prominent feature of the educational and scientific work of the public museums of this city. It has long been a feature of the meetings of clubs and societies of all kinds, not so much for instruction as for popular entertainment.

So general is the use of lantern illustrations at all sorts of gatherings, that it has become commonplace. It is necessary for the legion of lecturers who employ them to procure better, and yet better pictures, to make their performances attractive. We appear to be in the midst of a great rivalry as to who can make the finest pictorial display, and anybody, apparently, may occupy the platform.

At a recent meeting of ornithologists in Philadelphia, I sat for many hours watching a continuous performance of stereopticon lecturers. Some of them did their parts remarkably well, but the three-days meeting was manifestly, although unconsciously, a lantern-slide competition. During the intermissions, the audience, composed chiefly of professional ornithologists, talked almost entirely of the admirable pictures that had been shown, making animated comparisons of the success achieved by this or that photographer.

There have come among us hosts of skilful photographers or enthusiastic travelers, back from hasty trips to Zuñi or East Africa, ready to exhibit the best of pictures, to any kind of an audience that they can get, and to talk more or less amusingly while doing so.

Many of these so-called lecturers are successful enough, and audiences are forthcoming anywhere from the Museum of Natural History to the Suburban Entertainment Club. Even Peary's colored cook is doing a rattling lecture business with his master's slides.

Good pictures are dangerous in the wrong hands. Imagine a dull and dreary talker, still talking in public if he were deprived of lantern slides.

The use of lantern slides should be on a safer basis. They should not only be reduced in number, but be partially replaced with something more intellectual.

There could be no objection to lantern pictures as an inexpensive form of entertainment, if it were understood to be chiefly for entertainment, but when a fine collection of pictures of the Grand Cañon, accompanied by the talk of a mere traveler, is announced as a lecture on geology, it is a sign that we are losing our powers of discrimination.

When some superb pictures of Indian habitations on the table-lands of the southwest are described by a mere photographer engaged in making money out of the lantern slides, shall the authorities of the great museum allow the performance to be advertised as a lecture on ethnology? The City Bureau of Free Lectures employs a legion of lantern slide lecturers on travel, some of whom doubtless have never visited the lands they describe in glowing terms. There are art lecturers in this city showing colored photographs of the great paintings of Europe, who have never seen the originals. I am not undertaking to condemn the work of the free lecture bureau. It doubtless affords thousands of people entertainment that is wholesome and not without instruction.

Some of the lecturers make a specialty of describing the wonders of the Art Museum, or the Aquarium, and I personally shouldn't care to lose that much free advertising for my own institution. No doubt the pictures

[1] Part of a paper read at a meeting of curators of the public museums of New York, December 19, 1911.

and talk about art send many persons to the Art Museum.

But shall the museums, holding, as they do, authoritative positions respecting art and science, disregard the fact that the amateur is among us with lantern pictures that may be better than ours? Is it not time to consider whether by continuing as we are doing, we may be cheapening the labors of the distinguished specialists who cheerfully do their part in our own lecture courses?

There are reasons for believing that the general public is pretty well satisfied with what it gets, and also that it is incapable of distinguishing between the noted authority and the mere amateur who has the same kind of pictures. Shall we continue to be satisfied with this kindergarten way of lecturing?

Shall we continue to supply sugar-coated science until even the more discriminating part of the public begins to think that the professional ornithologist is really no better than the enthusiastic amateur who can photograph birds just as well?

While there are many of our number who can lecture most acceptably using lantern illustrations, there are certainly some of us who habitually depend upon the effect of the pictures used. Lecturing with lantern illustrations has so nearly superseded the well-prepared, authoritative discourse, that the latter has become a rarity.

I am convinced that what we have come to call lecturing is not the real thing, that the effect of the present over-illustrated lecture upon the audience is not what it should be.

The presentation is to the eye rather than to the mind, and the audience accepts it with a passive, rather than an active mind. The audience is already lost to the lecturer; he does not see its face, and there is no response to him.

In the experience of most of us, many a slovenly lecture has been tolerated because of the excellence of its illustrations. We continue to endure the indifferent talk of the lecturer, because we seem to be getting our money's worth out of his pictures.

In such a case the lecturer, perhaps a man of real scientific attainment, has actually degraded himself to the level of a showman. He may even be content with the applause bestowed only upon his achievements as a photographer.

But the audience, too, has degraded itself, by its intellectually languid acceptance. It will eventually tire of even the best of slides, and be satisfied with nothing less exciting than motion pictures.

The effect of the average lantern lecture can be readily judged by any one who cares to hear the remarks of the departing audience: "What splendid photographs," "How beautifully colored." We have all repeatedly heard just these words. The talk is of the *show*, and the self-satisfied showman on the platform has merely cracked the whip and given the signals to the real performer—the stereopticon man.

Let us contrast such a performance in the darkened hall, before an audience of sight-seers awaiting the next flash of the lantern, with that of a lecturer addressing the mind of his audience. Imagine Mr. Roosevelt or Beecher or Ingersoll receiving such applause as they have received if they had stood in the dark explaining pictures that might have told their own story. Have not some of our lecturers practically arrived at the point where the automatic lantern, carrying labeled slides, could do the trick as well?

But assuming that we must use pictures, what shall we say of the well-informed lecturer who thoughtlessly turns his back to the audience, and addresses the changing panorama on the screen, so that his weak voice can be heard only by those who sit in the front rows?

What shall we say of the lecturer, who, depending upon his pictures, has not prepared himself to discuss with at least a show of animation what each picture presents, and who can do little more than industriously wield the pointer, and inform his benighted audience that a tree is a tree, and a wild Indian an Indian?

What shall we say of the well-known writer, who, having no gift for extemporaneous speaking, mars the good effect of excellent il-

lustrations by neglecting to use the manuscript that would make his discourse coherent? Perhaps mere notes would save him from helpless verbal floundering.

What shall we say of that misguided person, who, having at least eighty pictures to illustrate his lecture on Alaska, or some other far-away place, throws in about forty more, to show how he got there? Half a dozen to get the ship away from the dock at Seattle, half a dozen shots at the city as he steams away, a few more at passing vessels, another half dozen at the members of his party (in which he is careful to show up in most of the groups himself), a few pictures of the captain, and about a dozen showing the Indian villages of the British Columbia islands, as he steams kodaking along, and all of which have been kodaked by a dozen tourists on every steamer, every week for the past twenty years.

I witnessed such a performance at the afore-mentioned meeting in Philadelphia. The exhibitor of slides held the platform for an hour and a half, until even the picture-bewitched ornithologists were audibly in revolt.

How shall we use the lantern slide? Is it not possible for the lecturer to first present his matter, so that it will appeal to the mind of his audience, and then follow his discourse with a limited number of illustrations selected for their fitness rather than their beauty? It would be quite useless to show pictures first. No audience will stay after the last picture. The unceremonious exit stampede begins at once, even if the distinguished president of the society has risen to make some concluding remarks.

And how about manuscript which is unfortunately often necessary? There is no need for a slavish use of manuscript, if the matter is good and delivered in a vigorous manner. Many speakers use it effectively. Ingersoll never spoke without it, and Roosevelt uses it for all lengthy discourses.

Our museum lecturer should unquestionably devote more time to preparation. He should make his address worth hearing without illustrations at all. He should be able to get the same applause for his matter that he gets for his pictures. When he does that he will be on a dignified basis himself, and will pay a long-deferred compliment to the intelligence of the audience, that it will be likely to appreciate.

I should like to see some of our museum men doing their platform work without pictures, and I am sure that some of them are capable of doing it. Most of those who try it should write out their lectures in full, and thus get the benefit of the work of arranging their matter and becoming familiar with it.

There must, of course, be reference to the manuscript, but the audience will not mind that if the subject is of real interest and the speaker deals with it in a forcible manner, impressing his hearers with the fact that they are listening to a man filled with his subject and sure that it is a good one. Lack of earnestness means that the audience will get weary or begin to slip out. I am sure that a good lecture half an hour long, followed by half the usual number of illustrations, will be an improvement on the present method.

Should we not illustrate our lectures, and cease to lecture about our illustrations?

C. H. TOWNSEND
N. Y. AQUARIUM

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## *RALPH STOCKMAN TARR*

As Cornellians and former students of Professor Ralph Stockman Tarr we learn with sorrow of his death and extend to his family our heartfelt sympathy and condolence. We feel keenly the loss to the university of his unselfish service and forceful personality, and we regret that his brilliant contributions to geology and geography have been cut off at a time when they were most fruitful and convincing. Above all we deplore the loss of the personal influence which we have found so helpful and inspiring in his home, in the class room and in the field. Those of us who have known him under the trying conditions of life in northern ice fields, where no hardship was too great to be cheerfully borne, can most fully

appreciate his devotion to the science he loved and the fineness and strength of his character.

Geo. H. Ashley,
V. H. Barnett,
J. A. Bonsteel,
B. S. Butler,
F. K. Cameron
M. E. Evans,
L. C. Graton,
R. T. Hill,
J. A. Holmes,
J. C. Hoyt,
L. O. Howard,
E. M. Kindle,
G. C. Martin,
G. C. Matson,
E. S. Sheperd,
C. W. Turrentine,
David White

Washington, D. C.,
March 22, 1912

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## *CHARLES ROBERT SANGER*

In the untimely death of Professor Sanger, on February 25, 1912, the Faculty of Arts and Sciences of Harvard University lost a loyal and faithful member, the chemical laboratory of Harvard College an efficient director, and the class of 1881 a devoted secretary.

Charles Robert Sanger was born in Boston on August 31, 1860. He graduated from Harvard College in 1881, received the Harvard degree of Master of Arts in 1882, and attained that of Doctor of Philosophy in 1884. From 1881 to 1882 and again from 1884 to 1886, he was assistant in the chemical laboratory of Harvard College, but in 1886 he went to the United States Naval Academy at Annapolis, as professor of chemistry. Six years later he was called to Washington University, St. Louis, Mo., and remained there until 1899, when he came back to Harvard as assistant professor of chemistry. He was called here because his service as assistant in qualitative analysis fifteen years before had been so able that he was deemed the most suitable person to continue the instruction in this favorite course when Professor H. B. Hill was obliged by other duties to relinquish it. Professor Sanger's return to Harvard was appropriate; he had never lost interest in the varied phases of our university life even when duty called him elsewhere. No son of Harvard has ever worked, according to his opportunity, more loyally in her behalf.

When in 1903 Hill laid down his work forever, Sanger was promoted to a full professorship, and on account of his marked executive ability and conscientious devotion, was the natural choice for the onerous directorship of the laboratory. Only those who have been privileged to work with him there can fully appreciate the extent to which he generously gave his time and thought in order to further the interests of all.

While first at Harvard as an assistant, he worked under Professor Hill on the constitution of pyromucic acid. In recent years he confined his work chiefly to the devising and perfecting of methods for the detection of minute quantities of arsenic, antimony and fluorine, as well as to the investigation of the chlorine derivatives of silicon and sulphur. Besides papers describing these researches, he wrote several laboratory manuals. His fine character was especially manifested in the great care he exercised in all his scientific work; he was determined that no untrue statement should ever escape his pen, and rigorous precautions and manifold repetitions of experiments doubtless prevented him from ranging over a wider field. As a teacher he tried to inculcate the same habits of methodical painstaking work which he possessed himself.

He was a Fellow of the American Academy of Arts and Sciences and a member of the American Chemical Society and the Deutsche Chemische Gesellschaft.

In 1886 he married Miss Almira Starkweather Horswell, who died in 1905, leaving three children. Five years later he married Miss Eleanor W. Davis, of Cambridge, who, with the children, survives him.

No one could watch his struggle against an insidious disease during these last years without a feeling of deep admiration for the courage with which he lectured and worked in spite of spasms of mortal pain and prostrating weakness; and the devotion and consideration of his classes was a striking testimony to the universal respect in which he was held.

T. W. Richards,
B. O. Peirce,
G. P. Baxter

## SCIENTIFIC NOTES AND NEWS

SIR J. J. THOMSON has been appointed by King George V. a member of the order of merit. The other scientific men who are members of the order are Lord Rayleigh, Dr. A. R. Wallace and Sir William Crooks. The order has recently lost through death Sir Joseph Dalton Hooker and Lord Lister.

DR. GEORGE T. MOORE has been elected director of the Missouri Botanical Garden to fill the vacancy caused by the resignation of Dr. William Trelease.

IT is expected that the Peter Bent Brigham Hospital, now under construction on land adjoining the Harvard Medical School, will be completed in October, 1912. Dr. Henry A. Christian, retiring dean of the Harvard Medical School, will be physician-in-chief, Dr. Harvey Cushing, of the Johns Hopkins Medical School, surgeon-in-chief, and Dr. H. B. Howard, superintendent.

PROFESSOR ARTHUR SEARLE, Phillips professor of astronomy at Harvard University, has presented his resignation after a teaching service at the university of forty-two years. He graduated from Harvard in 1856.

PROFESSOR JEAN GASTON DARBOUX and Professor Elias Metchnikoff have been elected honorary members of the Royal Irish Academy in the section of science.

DR. JUST LUCAS-CHAMPIONNIÈRE has been elected a member of the Paris Academy of Sciences in succession to the late Professor Lannelongue.

THE council of the British Iron and Steel Institute has awarded the Andrew Carnegie Gold Medal of the Institute to Dr. Paul Goehre, the metallurgist of Aachen.

DR. C. L. SHEAR, pathologist in the Bureau of Plant Industry, has sailed for Europe to spend several months in the investigation of fruit diseases.

DR. J. E. POGUE, assistant curator of mineralogy, U. S. National Museum, has returned to Washington after a three months' research and study trip in Europe.

DR. HERBERT M. EVANS, of the Johns Hopkins Medical School, has been granted leave of absence to go abroad to work in the laboratory of Professor Ehrlich, at Frankfort, during the coming summer.

DR. DOUGLASS WILSON JOHNSON, of Harvard University, who has recently been appointed associate professor of physiography at Columbia University, is spending a half year in Europe.

DR. FRANK BILLINGS, professor of medicine at the University of Chicago, has been appointed to provide the details of the program for the section of epilepsy of the State Conference of Charities and Corrections to be held in Chicago next October.

MR. E. J. MCCAUSTLAND, professor of municipal engineering in the State University of Washington, has been appointed a member of the State Board of Health. Professor McCaustland has for three years acted in the capacity of consulting sanitary engineer to the board.

IN the preliminary list of papers to be presented at the eighteenth international congress of Americanists to be held in London, beginning on May 27, there are titles from the United States by Dr. Franz Boas, of Columbia University; Dr. A. Hrdlicka, of the U. S. National Museum; Dr. Charles Peabody, of Harvard University; Mr. Stansbury Hagar, of New York.

PROFESSOR JOSEPH P. IDDINGS, of Washington, will deliver a course of lectures to the geological students of the Johns Hopkins University, on "The Problems of Petrographical Provinces." The lectures will be given during the last two weeks in April.

THE Rev. Caspar René Gregory, professor of theology in the University of Leipzig, has concluded a special course of lectures at Western Reserve University. The lectures included a series of six on the subject "Five Hundred Years of Science in Leipzig."

THE Society for Biological Research of the University of Pittsburgh held, on March 20, its second special meeting for the year 1911–12, at which time Dr. Robert Russell Bensley,

director of the Hull Anatomical Laboratories of the University of Chicago, gave an address on "The Structure of the Pancreas and its bearing on the Islet Theory of Diabetes."

The twentieth "James Forrest" lecture will be delivered at the Institution of Civil Engineers on April 19, by Mr. H. R. Arnulph Mallock, F.R.S., his subject being "Aerial Flight."

Sir William Macewen will give an address on Lord Lister at the meeting of the Royal Institution of Great Britain on Friday evening, June 7.

A portrait bust of the late Sir Joseph Hooker, from a sitting taken just before his death, has been completed by Mr. Pennachine.

The funeral of Dr. Thomas H. Montgomery, Jr., professor of zoology in the University of Pennsylvania, was held on Friday, March 22, at St. Mary's Episcopal Church. The honorary pallbearers were: Provost Smith, of the University of Pennsylvania; ex-Provost Charles C. Harrison; Professor E. G. Conklin, of Princeton University; Professor G. H. Parker, of Harvard University; Professor J. P. Moore, of the University of Pennsylvania; Professor W. M. Wheeler, of Harvard University; Professor William R. Newbold, of the University of Pennsylvania; William S. Morris and Professor Philip P. Calvert, of the University of Pennsylvania.

Dr. James Rufus Tryon, formerly medical director of the navy, retired with the relative rank of rear-admiral, has died at the age of eighty-two years.

The late Lord Wandsworth has bequeathed over a million pounds to establish an orphanage and school; the will also contains a bequest of £10,000 for medical research.

Miss Helen Swindells, of Southport, has bequeathed £5,000 to the University of Manchester for cancer research, and £5,000 to the benevolent fund of the Institution of Civil Engineers.

The John Hay Library at Brown University will be augmented by a collection of seven thousand volumes on engineering subjects, the gift of Mr. Elmer L. Corthell, the hydraulic and waterways engineer. The gift of the Corthell Library, as it is to be known, carries with it an endowment fund of $5,000.

A series of prizes is offered by a member of the Torrey Botanical Club for the best popular article on some feature of the vegetation of the local flora range. The prizes will be as follows: (1) A first prize of $25; (2) a second prize of $15; (3) for the five next best articles, a year's subscription to *Torreya*. (Offered by the club.) The competition is open to all amateurs, school teachers and others not on the staff of a botanic garden, college or university.

The fifth session of the Graduate School of Agriculture will be held under the auspices of the Association of American Agricultural Colleges and Experiment Stations, at the Michigan Agricultural College, East Lansing, Mich., July 1–26, 1912. Director A. C. True, of the United States Office of Experiment Stations, will be dean of the school and the faculty, as usual, will consist of some of the leading scientific men from the United States Department of Agriculture, the American agricultural colleges and experiment stations, other American universities and European institutions. Two lecturers have been secured from England, Dr. A. D. Hall, of the Rothamsted Experiment Station, and Professor F. H. A. Marshall, Christ College, Cambridge University. This school is open only to college graduates who want to pursue advanced work in agriculture. Graduate courses will be given under the general head of soils and plant physiology, animal physiology, agronomy, horticulture, swine husbandry, poultry husbandry, beef and dairy cattle, rural engineering and rural economics. Among the more important topics that will be given consideration at this time are the part played by the soil solution in the nutrition of plants, the relation of the physiology of plants to the soil problem, colloids in relation to soil fertility and soil bacteriology, zootechnical problems in relation to the physiology of the cell, the physiology of reproduction and the biology of sex, plant production

problems in relation to plant breeding and adaptation, problems dealing with the transportation, handling and storing of fruit, rural sanitation, road making, rural social surveys and rural festivals as agencies for social contact.

THE department of electrical engineering of the Massachusetts Institute of Technology has under way an important investigation on the adaptability of electric vehicles for trucking purposes, more especially with reference to the conditions in Boston and its vicinity. Mr. H. F. Thomson, the research associate, in carrying on this work, is making substantial progress in the inquiry. The inquiry is directed along several particular lines, including cost of the service, convenience of the service, difficulties and expenses due to the delays in loading and unloading at freight houses and the like, delays caused by drivers, and corresponding matters. The railroads entering Boston are cooperating with the part of the investigation relating to time occupied in loading and unloading trucks at the freight houses, including the time occupied in getting to the loading platform. The freight house conditions are being investigated by students of the department under the direction of Mr. Thomson. An appropriation for this work was made to the institution by the Edison Electric Illuminating Company of Boston. The research was begun about the middle of the year 1911 and is expected to extend beyond the year. It is expected to result in a report or series of reports on the relative merits of electric vehicles, other mechanical vehicles and horse vehicles for city and suburban delivery, for trucking and for the other purposes for which vehicles are used in the city and its suburbs. The department has had erected in Brookline a 700 foot span of number two naught bare stranded wire to represent a transmission span on towers, and has had this span under observation during the severe weather of this winter. The object is to learn more exactly the effects of ice, sleet and wind loads, and of temperature effects on the stresses imposed upon the wire and its supports. This research is being carried on by two students under the direction of Professor Harold Pender. There are now a larger number of candidates for advanced degrees in electrical engineering than the department has ever previously seen, and the various branches of research which are being carried on are being constantly enlarged. This is in addition to the extended undergraduate work for which the department is notable.

THE copper mines of the United States have produced more than fifteen and a quarter billion pounds of copper, and of this total twelve mining districts have produced in excess of 100,000,000 pounds each, according to the United States Geological Survey. These twelve districts, located in eight states, have yielded 94.69 per cent. of the total output of the country since 1845, when the total product of the United States was but little more than 200,000 pounds. These districts are Butte, Mont., which has yielded 5,315,000,000 pounds, or 34.75 per cent. of the total production; Lake Superior, Mich., which has yielded 4,756,000,000 pounds; Bisbee, Ariz., 1,285,000,000 pounds; Morenci-Metcalf, Ariz., 882,700,000 pounds; Jerome, Ariz., 570,000,000 pounds; Bingham, Utah, 465,000,000 pounds; Shasta County, Cal., 336,000,000 pounds; Globe, Ariz., 334,700,000 pounds; Ducktown, Tenn., 211,700,000 pounds; Ely, Nev., 125,000,000 pounds; the foothill belt, California, 104,000,000 pounds; and Santa Rita, N. Mex. (where mining is believed to have been begun as far back as 1800), 103,000,000 pounds. All other districts have produced 804,300,000 pounds. It is interesting to note that the first ten of these districts are also the first ten largest producers to-day, although the order is slightly changed. These ten districts yielded 93.84 per cent. of the production for 1910. The United States is by far the greatest copper-producing country, our smelter output of copper in 1910 being 56.75 per cent. of the total for the world. Nearly every one of the leading copper-producing districts of the United States, according to the Geological Survey, made a record output within the three years preceding 1910, and nearly every one of them could have done so in 1910 so far as the ability of the mines

to produce the ore was concerned. An indifferent copper market and metallurgical difficulties, however, resulted in a decrease in the output for 1910 for several districts. The Survey's estimate on January 2, 1912, indicates a copper output for 1911 greater than that of 1910 and nearly equal to the record production of 1909. It is further stated that most of the companies are now in a position to maintain or even increase their present output, so that, if the consumption of the metal will permit, the production of copper in the United States for 1912 may be expected to show a marked increase. It is noteworthy that not one of the leading copper districts of the United States, several of which have been active producers for 30 years or more, has been worked out or shown a decrease in its ability to produce copper.

## *UNIVERSITY AND EDUCATIONAL NEWS*

An anonymous gift of £100,000 has been made toward enabling the University of London to acquire a site north of the British Museum. The university has also received £60,000 from the Draper's Company for a senate house and administrative offices.

An anonymous donor has undertaken to give £20,000 to the University of Cambridge, to establish a chair of genetics, to be called the Balfour professorship of genetics, in honor of Mr. A. J. Balfour.

The nomination is announced of Dr. Edward H. Bradford, A.B. (Harvard, '69), professor of orthopedic surgery, to be dean of the Harvard Medical School.

Professor Geo. M. Reed, of the University of Missouri, will have charge of the botanical work in the New York University during the summer session of 1912.

Professor H. A. Wadsworth, of the department of forestry, University of Idaho, has resigned to accept a commission in the United States army. Mr. Erwin W. Cook, B.S. (Washburn), M.F. (Michigan), has been appointed instructor in forestry at the university. He has been forest assistant on the Salmon (Idaho) National Forest for the past two years.

## *DISCUSSION AND CORRESPONDENCE*

### PRINCIPLES OF WATER-POWER DEVELOPMENT

To the Editor of Science: In presenting "Another View of the Principles of Water-Power Development,"[1] Professor Aldrich illustrates his idea of individual ownership of water in part by the pronouncement, "A man owns the water in his well, we all believe." He utterly ignores the case (occurring with increasing frequency as population and industrial use of water advance) in which the sinking of a larger or deeper well in the neighborhood robs the earlier well of its supply; and he equally ignores all other of those physical facts and relations concerning water which are of growing consequence and complexity as the uses of this primary resource increase and multiply.

Professor Aldrich illustrates his view of equity in the use of water by reference to power development at Shoshone Falls and Twin Falls, and declares that the only "part of the people" of the United States equitably interested in this use are "simply those who live within the range of power transmission, and are not more accessible to another source of power." He utterly ignores the paramount uses of water for domestic supply and the production of food; he ignores the patent fact that each year and each decade more and more of the water of Snake River is removed for these paramount purposes, and the certainty that within a generation practically all the water of Snake River valley will be consumed for these paramount purposes, leaving only a sufficient flow for natural sewerage with incidental power development and navigation; and he equally ignores the broad fact that "the people of Cape Cod, or of Washington, D. C.," who consume bread and beet sugar and other products of Snake River valley, have a most real interest in such utilization of the waters of that river as will best promote normal production and industrial development—*i. e.*, as will best contribute to the general welfare. Perhaps the clearest indication of Professor Aldrich's no-

[1] Science, March 1, 1912, pp. 338–340.

tion as to equities in water appears in the pronouncement that under common ownership "the general government should collect as a tax" on all users of water amounts which may be defined broadly as corresponding to the railway standard of "what the traffic will bear"; he ignores the fundamental economic principle that while common ownership implies the right to impose conditions of distribution and use, it involves primarily the obligation to minimize taxes or other costs of distribution in the common interest.

In pointing his views as to the finality of legal relations already developed in the west, Professor Aldrich declares, "Every western state has voluminous laws on the subject, and ten times more voluminous legal decisions on those laws." Were his familiarity and sympathy with the west still greater than he professes, he would realize that the Idaho water law is better than that of Wyoming after which it was modeled, that the later Oregon law is still better, and that the California water law enacted a few months ago is the best of all, since with each passing year growing knowledge as to physical facts and relations, increasing population and industries, and concurrently advancing standards of equity fall into closer accord—indeed he would realize that the very principles he criticizes are the outcome of experience in the west, where the natural water supply is so meager that it is necessarily measured and apportioned and utilized more carefully than in any humid land, and might even learn that the proposition *All the water belongs to all the People* was first crystallized and expressed through the National Irrigation Congress (an essentially western organization, made up of western men, dominated by western ideas) at a meeting in Spokane wherein the preponderating representation was from Washington, Idaho, Montana and Oregon.

To those unfamiliar with the situation it may be of interest to know that two opposing views concerning the administration of water and other resources have come up in the western states; the formerly prevalent but now minority view is that the resources shall be exploited for the private profit of those who acquired possession before their value was realized; the later view, already held by the great majority, is that the resources shall be developed, conserved against needless destruction, and utilized in the common interest, under customs and laws established primarily by communities, secondarily, by states, and finally, as need arises, by the federal government. On these opposing views Professor Aldrich contributes polemics, which may be needful pending more specific knowledge; but it is to be regretted that he does not contribute a fact, a figure, a principle, or any other iota of that definite foundation on which alone scientific discussion may fitly rest, and on which sound legislation may eventually be erected—unless, indeed, he is right in his remarkable main contention that the western states, commonly considered the most actively-growing part of the country, are already so bound by statutes and decisions that further progress is impossible.

W J McGEE

## DR. RADOSAVLJEVICH'S "CRITIQUE" OF PROFESSOR BOAS

TO THE EDITOR OF SCIENCE: The number of the *American Anthropologist* just issued from the press (Vol. 13, 1911, No. 3) contains an article by Dr. Paul R. Radosavljevich entitled "Professor Boas's New Theory of the Form of the Head—a Critical Contribution to School Anthropology" (pp. 394–436). The admission of such an article into a respectable scientific journal seems to have resulted from a misapplication of the praiseworthy editorial principle that no student, however high his professional standing, shall be exempt from the most rigorous criticism on the part of the least of his fellow-workers. In the present instance, however, we have to deal not with a critique, but with a lampoon. The extraordinary character of Dr. Radosavljevich's paper requires an immediate reply, especially in view of Professor Boas's protracted stay in Mexico. Without desiring to forestall a fuller rejoinder by those more

competent to speak on the subjects under discussion, I regard it as necessary to illuminate in a preliminary way the nature of the "contribution" that seeks to brand one of the most critical scientific thinkers of the age as an irresponsible sensation-monger incapable of the most obvious precautions against errors of observation and interpretation. I will confine my attention to two points: (1) Dr. Radosavljevich's representation of Professor Boas's theory; (2) Radosavljevich's refutation of "Boas's first conclusion."

1. Dr. Radosavljevich writes (p. 405):

> On page 32 of his [Boas's] report[1] he says that no evidence has been collected which would show an actual change in type due to the direct influence of environment, because the type of immigrants changes from year to year, owing to a selection which is dependent upon the economic conditions of our country, ''far-reaching'' changes in ''type'' which ''can not be ascribed to selection or mixture.'' According to Boas the racial characteristics do not survive under the new social and climatic environment of America. We may therefore call Boas's theory the *environmental-economic* theory, the first theory of its kind; *environmental,* because it claims that the descendants of the European immigrants change their type *''even in the first generation almost entirely.''* . . .
>
> The theory may be called *economic,* because it claims that the panics of 1893 and 1907 caused a ''sudden decrease in the *general* physical development of immigrants'' and a ''sudden'' increase in the cephalic index.

A comparison of page 32 of Boas's report with the exposition just quoted at once absolves Dr. Radosavljevich from the charge of morbid devotion to accuracy of statement. On page 32 Professor Boas has nothing to say of the economic conditions of our country; nor is there a word on the causal connection between changes due to environment and the change in type of immigrants due to economic selection. In the first paragraph of page 32 Professor Boas states that the form of the body seems to be the most stable characteristic of any given race, but that Gould and Baxter, Bowditch and others have found indications that under more favorable environment the physical development of a race may improve. Then follows the statement:

> No evidence, however, has been collected which would show an actual change in type due to the influence of environment. Where changes of this kind seem to occur—as, for instance, in a comparison of the types of city population and country population in southern Germany and in Italy—the inclination of observers has been rather to attribute the difference either to the selective elimination of the weaker type or to the immigration of different types.

After a brief transitional sentence Boas then, in the final paragraph of the page, proceeds to characterize the contribution to knowledge made through his own investigation as compared with the contributions of his predecessors as previously summarized: while *they* had collected no evidence showing an actual change in type due to environment, but were inclined to ascribe changes to selection or mixture, *Boas* has demonstrated "a far-reaching change in the type—a change which can not be ascribed to selection or mixture, but which can only be explained as due directly to the influence of environment."

Our comparison makes it impossible to characterize Dr. Radosavljevich's exposition of page 32 in parliamentary language.

What, then, of Boas's "economic" theory? This, it may be well to mention, is a favorite butt of Radosavljevichian sarcasm (pp. 415, 420, 426). The fact of the matter is that, on page 28 of his "Report," Boas states that after the panic of 1893 a sudden decrease in the general development of immigrants occurred and persisted for several years; that a similar change *seems* to have occurred after the panic of 1907, and that his observations on this point have been confined to East European Hebrews. On page 30 we learn that among the questions not yet studied by Boas, is "the important problem of the selection which takes place during the period of immigration, and which is indicated by the change of type of immigrants after the panics of 1893 and 1907." On page 39 Boas again calls at-

[1] ''Changes in Bodily Form of Descendants of Immigrants,'' Washington, 1910.

tention to the drop of all absolute measurements of foreign-born Hebrews arriving in America after 1894.

> An attempt to combine all the material, adult and children, for these years, brings out the sudden drop after 1893 even more clearly; and a similar phenomenon is repeated between the years 1907 and 1909. For this reason I am inclined to believe that the type of immigrants is directly affected by financial panics. This can be due only to a selection which takes place in Europe, and which may also be affected by the return emigration from the United States to Europe. The material, so far as it has been discussed, does not give a definite answer to this important question, the solution of which would require a series of parallel measurements taken in Europe.

Were there any possibility of misunderstanding the foregoing statements, it would be eliminated by the legend of Boas's Fig. 17:

> The most striking feature of the diagram is the general decrease in all measurements in the period following the year 1894, which indicates that the arrivals during the period following the panic of 1893 were underdeveloped in every direction.

When Radosavljevich reproaches Boas for not studying the effect of American soil and financial panics on the *same* individuals during a period of time representing the age of his subjects (p. 420 f.), he shows that he has not the faintest notion of what Boas is discussing in connection with financial panics.

Unfortunately those who attended a meeting of the American Ethnological Society on March 27, 1911, will be unable to accept this relatively favorable view of Dr. Radosavljevich's attitude towards the "economic" theory. For at that meeting Dr. Radosavljevich, in the course of a lengthy paper, presented a temperate, and formally quite unexceptionable, criticism of what he conceived to be Boas's economic theory. In a discussion Professor Boas pointed out that the criticism rested on a misunderstanding, and Dr. Radosavljevich then—in the presence of Professor Farrand, Drs. Spinden, Goldenweiser and Fishberg, the present writer, and other anthropologists—publicly apologized for his misinterpretation with much profusion of courtesy. This circumstance seems to have escaped Dr. Radosavljevich's memory.

2. Dr. Radosavljevich asserts that Boas's own observations do not support his theory of a change of type (pp. 406–411, 429). For, says he,

> All Hebrews (born in America and in different countries of Europe) are of the same sub-brachycephalic type. Not one age, not one sex, not one individual of Hebrew nativity is represented either by dolichocephalic or by mesocephalic type. The same is true in its way of the Sicilians measured. They are of a high mesocephalic type, both in America and in Europe.

It would be difficult to find in the whole range of scientific literature a more naïve instance of conceptual realism. For Radosavljevich the conventional classificatory divisions of head forms obviously have an absolute biological value. Boas states that foreign-born Hebrews have an index of 84, American-born Hebrews an index of 81. That this difference is a *real* difference results, of course, not from a mere inspection of these two figures, but from the customary statistical treatment of the series involved. But Radosavljevich's mind is undebauched by statistical method. What matters a change of 3 units in the cephalic index so long as "the bulk of both American-born and foreign-born Hebrew boys and girls belong to the same brachycephalic (or rather to the sub-brachycephalic) type"? Sub-brachycephaly ranges from 80 to 86.9. Had Boas found that American-born Hebrews had an index of 79.9, then, we may presume, Dr. Radosavljevich would have hailed the result as the discovery of an actual change of type, provided only that foreign-born Hebrews had an index of 80.001!

As the subject of head forms has an esoteric tang, it may be well to illustrate the logical point at issue by statures. Suppose that we class men below 5 feet 8 in. as short, above 6 feet as tall, and between these limits as middle-sized. Assume further that a race which in Europe has an average height of 5 feet 3 in. adds three inches to its stature in America. Then, according to the classifica-

tory realism of Dr. Radosavljevich, we should not be justified in asserting that a difference in type had taken place, for both statures, 5 feet 3 in. and 5 feet 6 in. fall within our category of shortness. As a matter of fact, it depends entirely on the statistical comparison of foreign-born and American-born individuals (involving the numbers of cases and standard deviations) whether the difference is a real one. A difference of 1 cm. may constitute an actual difference of type in the statistical sense.[2] Dr. Radosavljevich's inability to grasp what Boas means by "a change of type" and in his insistence on dragging in the irrelevant conventional classification of head forms must be regarded as pathetic.

I believe I have sufficiently elucidated the nature of Dr. Radosavljevich's contribution. I should gladly have refrained from any comment, were it not for the regrettable fact that there are so few anthropologists in America who are able to form an intelligent opinion on the issues involved, and that the uninitiated are liable to be deceived by Dr. Radosavljevich's imposing array of bibliographic references.

Robert H. Lowie
American Museum of Natural History

## Report of the Seal Commission

To the Editor of Science: In a recent debate in the House of Representatives on the fur seal bill, Congressman N. E. Randall, of Iowa, made the following statement, as reported in the *Record*, p. 2158:

> Dr. David Starr Jordan wrote a book. He appropriated this chart of Professor Elliott's and incorporated it into his book as his own. Dr. William T. Hornaday, of New York, subsequently wrote a book. He saw Dr. Jordan's book containing this Elliott chart, and Dr. Hornaday reproduced that chart in his book crediting it to Dr. Jordan. About that time Professor Elliott became alive to the situation and wrote a letter of protest to David Starr Jordan. Dr. Jordan was compelled to admit the plagiarism of the chart and that Dr. Elliott was the author of it and the discoverer of the facts it exhibits.

This charge of plagiarism is so specific and circumstantial that it demands an answer. The chart referred to is doubtless the one printed in the back of the first preliminary report of the Seal Commission of 1896–7, of which Dr. Jordan was chairman. As secretary of the commission I am familiar with the circumstances. When the manuscript of the report was submitted to the Treasury Department, Mr. Charles S. Hamlin, then assistant secretary, suggested the advisability of a chart or map giving the relative location of the Seal Islands and showing the general migration route of the herd. The commission had in process of preparation, under the direction of Mr. Charles H. Townsend, for its final report, an authentic chart of the herd's migration route to be platted from the log records of numerous sealing vessels, but this could not be got ready in time for the preliminary report, and Dr. Jordan was averse to publishing a merely conjectural chart. The assistant secretary held that such a chart, even if not strictly accurate, would be useful to the general reader and indicated how it could be readily compiled from the records of the department. Dr. Jordan acquiesced in this arrangement and left the entire matter of the preparation and printing of the map to the department. He did not see the chart until it appeared in the printed report. That the chart appears without legend as to authorship or source was explained by the fact that it was prepared by the department's own draftsmen and from its own data. Furthermore, the chart contains no information which was not at that time the common property of any one having a general knowledge of the subject. It consisted of a series of curved lines emanating from the passes of the Aleutian Islands, sweeping down through the North Pacific Ocean, veering toward the American coast and returning to the Aleutian passes and thence to the Pribilof Islands, the winter months being printed in the series of lines at points supposed to mark the progress of the herd. How completely this chart was superseded by Mr. Townsend's records platted from some 120 sealing logs will be seen by reference to his

[2] Westergaard, "Die Grundzüge der Theorie der Statistik" (Jena, 1890), p. 187.

chart published in volume 3, p. 234, of the final report of the commission. That any one should claim authorship for this discarded chart is remarkable. Certainly Dr. Jordan never has. When, after a number of years, Mr. Elliott laid claim to it, Dr. Jordan was assured by the Treasury Department that it was under no obligations to Mr. Elliott for the chart.

GEORGE A. CLARK

STANFORD UNIVERSITY,
February 28, 1912

## QUOTATIONS

### LORD LISTER AND WESTMINSTER ABBEY

IT is only by reason of Lord Lister's known wish that he is not buried in Westminster Abbey. Yesterday an impressive service was held there to give expression to feelings of gratitude and thankfulness, and in memory of what he has done for mankind. Posterity does not always confirm the opinion of contemporaries as to those meriting such honor. The Abbey has its monuments of the pseudo-great, statutes of justly forgotten worthies, inscriptions pretentious if not mendacious. If there were a centennial expurgation, much might be cast out. But of this we may be assured, that it would have been matter of enduring surprise and reproach if no place had been offered in the Abbey for the great healer who has passed away. It is crowded with memories or associations of strife and enmities, and heroism displayed therein. The world does not fight every day as of old, at all events with enemies of one's own race; and so, as time goes on, if the Abbey is to continue to be the place where the nation's chief worthies repose or where it bids them farewell, it must be associated more and more with the heroes and victims of peace. He who cured where death had been certain, who brought hope where there had been despair; he who found surgery, as some thought, little more than the art of killing quickly those who would have died slowly, and who transformed it into a wellnigh miraculously beneficent agency for the relief of human suffering—he, of all others, merits such honor. We are not undervaluing the ceremony of yesterday—one of the most impressive ever held in the Abbey; one in which every one present was a sincere mourner—in saying that there will be many unseen and nameless tributes of gratitude which Lord Lister would have valued even more. In every hospital, the world over, must be some who, the subjects of operations successfully conducted by reason of his methods, will, on the news of his death, think of him with gratitude. The victories of war are fleeting; they may be over in a day or an hour; and some of the greatest of them are local in their effects. But those of the healing art, such as were due to Lister, are renewed everywhere and for all time.

There exists no means of measuring, even approximately, the amount of pain and suffering in the world at any given time. We can not doubt that it varies from age to age; and there is no certainty that it decreases with the growing complexity of our every-day life. While some primitive sources of suffering, such as famine, pestilence and war, may diminish, others may increase. The hurry and tear and wear incident to our civilization make more calls upon the nerves; they are always on the stretch; and it is not improbable that we are more susceptible to pain than were our rude ancestors. It is the drawback of so many discoveries and inventions that they take away from us almost as much as they give; they create unrest and multiply needs; they spread the limited capacity for pleasure over many objects, to the impairment in the end, it may be, of the total amount of enjoyment; and the greatest marvels of ingenuity may leave us no richer in essentials than before. The inventor who robs us of nothing, whose gifts are all pure gain, is the healer who has found secrets before unknown. In life the presence of pain is the mystery of mysteries. The moralist offers us his feeble explanations, and tells us that without sacrifice no permanent satisfaction or truly good results can be attained; that, to use a common and unconvincing expression, it is a masterful and wholesome discipline; that, to cite the words of one who in all sin-

cerity expounded this unsatisfying solution, by pain we are "driven ever onwards." Such consolations have stifled few cries or groans. The fact borne in upon all who were familiar with surgery in the pre-Lister days was that there was so much suffering to all appearance sheer waste; a heavy price was paid and nothing was gained; the way through discomfort and distress lay to more of both. And so we all instinctively place masters of the healing art, certainly those who have found new remedies and effective methods, among the great benefactors of men. They, and almost they alone, among inventors and discoverers have given much and taken from us nothing.

One further reflection must have been present to many in the Abbey yesterday. Lord Lister's discoveries and methods have opened up possibilities of still further advances, scarcely dreamed of before. The surgeon whom our ancestors regarded as the most highly paid of executioners is seen to be the possessor of an art the future of which is limitless. Lister and his coadjutors have shown what are the enemies to be guarded against and how they are to be encountered. He has opened a way which will be pursued, it may be confidently expected, with signal results. To use the words of the anthem yesterday, "His body is buried in peace, but his name liveth for evermore"; chiefly, no doubt, for his benéficent discoveries, but partly also by reason of the memory of his character, for all time the type of the faithful servant of science. Good as well as great, modest, genial, zealous in the interest of his patients, seeking truth unweariedly and calmly, he will, we do not doubt, be the model and example of men who will carry the art of healing far beyond the point which it has to-day reached.—The London *Times*.

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## *SCIENTIFIC BOOKS*

*The Chemistry of the Radio-Elements.* By Frederick Soddy. Longmans, Green and Co. 1911. Pp. 92.

There is probably no branch of modern science which has offered so great an attraction to the casual student as the subject of radioactivity, and there is certainly none which has afforded a more unrestricted field to the ambitious author who, with but little first-hand information, has been eager to popularize the views of others or to support enthusiastically unsound doctrines based on a wholly insufficient knowledge of the fundamental principles or the value of experimental evidence. It is a pleasure therefore to be able to welcome the appearance of Mr. Soddy's book, written as it is by one who possesses so wide a knowledge of the topics treated and who has played so important and prominent a part in the development of the subject of radioactivity.

The book begins with a brief statement of the scope and objects of radio-chemistry. This is followed by a general discussion of the phenomena of radioactivity, the first discovery by Becquerel of the emission of characteristic radiations by uranium compounds, the general properties of these radiations, and the extension of our knowledge which resulted from the pioneer work of Madame and Monsieur Curie. To the novice in the subject, the text at this point is likely to lead to a somewhat exaggerated notion of the part played by the Curies in the development of the general theory, but difficulties of this sort are apt to arise in any attempt at a condensed treatment of so complex a subject, and the author has succeeded in preparing a distinctly instructive outline in which the more important facts are presented in a clear and orderly fashion. The characteristic differences in the relative permanence or stability of the different radio-elements are mentioned, the production by certain of these of gaseous radioactive elements or emanations is described, and the properties of the emanations themselves are briefly considered. Then follows a discussion of the interesting experiments on the radioactivity of thorium salts, which led to the formulation of the disintegration theory, and an outline is given of this theory in its more important phases.

The next topic treated is the general nature of the three types of radiation, the alpha, the beta and the gamma rays. The characteristic

properties of each of these are considered at some length and the evidence pointing to the identity of the alpha particles with charged helium atoms is clearly presented.

The second chapter is devoted to the radioactive constants and periods of average life of the radio-elements. Here, as elsewhere in the pages which follow, Mr. Soddy has shown a preference for denoting the relative stabilities of the different radio-elements by their so-called "average life" periods rather than by their "half-value" periods adopted and used by nearly (if not quite) all the other writers on the subject. To the reviewer the "average life" of a radio-element is merely the reciprocal of the constant of radioactive change, an occasionally convenient mathematical expression having little or no objective significance. Mr. Soddy defines it as "the sum of the separate periods of future existence of all the individual atoms divided by the number in existence at the starting point." The "half-value" period, on the other hand, is the time required for exactly one half of any given quantity of a radioactive substance to disintegrate or be transformed into other types of matter.

A very interesting and suggestive section on radioactive equilibrium completes the second chapter.

The title of the third chapter is the "Classification and Nomenclature of the Radio-elements.—Analogies Between the Three Disintegration Series," but the subjects covered are much more comprehensive than this heading would imply and include many topics of extreme interest and importance. In the opinion of the reviewer this chapter is the most valuable and illuminating portion of the entire book and the one to be most profitably extended and developed in future editions. It contains the essence of a new branch of science, radiochemistry, and Mr. Soddy has succeeded in collecting together and presenting in a relatively small space, and in a very impressive and convincing manner, much that has previously been accessible only in scattered scientific publications of his own and of other workers in this field of scientific inquiry. Thus, for example, the conditions determining the possibility of separating and isolating any given radio-element in a state of comparative purity are briefly but comprehensively considered, the general methods of obtaining the so-called "active deposits"—the solid radioactive products resulting from the disintegration of the gaseous emanations—are outlined, and the inferences to be drawn as to the true chemical nature of the different radio-elements from a knowledge of the behavior of these when mixed with large proportions of their apparent chemical analogues are discussed in some detail.

This general introductory matter occupies in all only thirty pages and one can not avoid a feeling of regret that it was not found practical to extend it still further. It is followed by a systematic presentation of the more important physical and chemical properties of the thirty-odd radio-elements thus far identified arranged in an orderly fashion under the separate headings, "Uranium," "Uranium X," "Ionium," "Radium," etc.

Mr. Soddy has provided us with a very valuable book of its kind, unique in respect to the field which it covers. It need scarcely be added that no one who desires to work intelligently in this modern branch of chemistry can well afford to be without it.

B. B. BOLTWOOD

*Stability in Aviation: an Introduction to Dynamical Stability as Applied to the Motion of Aeroplanes.* By Professor G. H. BRYAN, Sc.D., F.R.S. Macmillan and Co. 1911. Pp. xi + 192. Price, $2.00.

Any one seriously at work on the theory or the art of aviation would profit by reading what he can of this book, though precious few will have both the time and the ability wholly to master it and probably none, not even the author of it himself, fully to solve all the difficult problems it sets.

The first chapter gives, in 18 pages of concise non-mathematical language, a summary of existing knowledge on aeroplane stability, and incidentally forms a good mental appetizer for the very solid intellectual courses that fol-

low. But the busy man and the man without mathematical training must take the statements of the next 8 chapters, or 146 pages, on faith. The essential equations in the greatest abundance are there and their meanings explained, but checking them all up would be no easy task.

The general conclusions all this mathematical work leads to are given in a short chapter of only 6 pages, and in another place 20 separate theses are proposed that should set many young men at work on problems that are both new and useful in applied mathematics.

But, the "practical" man will say, what's the use of all this theory and all these mathematical equations? The answer in this case as in all similar cases is: To tell the practical man what to practise, what experiments are needed and what are not, what general type of machine is likely to succeed and what is certain to fail; to save him from needless blundering and to assure him of results and how to obtain them that he never did and never would even dream of.

Professor Bryan's book is especially adapted to the needs of advanced students in physics, applied mathematics and certain branches of engineering, and richly deserves a place in both mathematical and physical libraries.

W. J. Humphreys

*Non-Marine Mollusca of Patagonia.* By Henry A. Pilsbry. Reports Princeton University Expeditions to Patagonia, Vol. III., Part V.

This important work was issued in 1911, but there is nothing about the separate issue to indicate the date. It deals with the non-marine molluscs of Tierra del Fuego and Patagonia as far north as the thirty-ninth parallel, and is most beautifully illustrated by colored and uncolored plates. Of certain families, all the South American forms are listed. At the end is given a most interesting discussion of the characteristics and origin of the South American Mollusca.

The poverty of the Patagonian fauna in land snails is remarkable. Seven Endodontidæ and the two Zonitidæ have been described, all small. Their precise affinities are uncertain, from lack of knowledge of the internal anatomy. A small slug has been reported, perhaps introduced. *Succinea* is represented by several species, one of them abundant. No doubt other species will be discovered, but certainly no other part of the world, in a similar latitude, has such a meager representation of land shells. With the fresh-water snails it is somewhat different, the fauna not only containing a number of species of the families familiar in the northern hemisphere, but also a rich representation of the Chilinidæ, a family confined to the temperate and cold zones of South America. All the Chilinids east of the Andes are discussed, with four fine plates. Six colored plates are devoted to the Amnicolid genus *Potamolithus*, of which a complete revision is given. There is a complete list of the South American Sphœriidæ, with descriptions of several species. Thus the work, while ostensibly a report on the Princeton collections, is in reality much more extensive and important than the title would suggest.

All zoologists will be interested in the general discussion of the fauna. Dr. Pilsbry recognizes a Cœnogæic or northern group of families, and an Eogæic or southern group, the latter having "occupied chiefly the Gondwana continent, including a large part of South America, tropical and South Africa, and stretching in a great arch, possibly at no time perfect, to peninsular India and Australia." It is in this second group that he would place the Mutelidæ, Ampullariidæ, Acavidæ, Bulimulidæ, Achatinidæ, Streptaxidæ, etc. With regard to Antarctica, it is shown that the non-marine molluscs, taken by themselves, indicate that: (1) "There is no evidence that Antarctica was ever an evolution or radiation center for non-marine mollusks, though there is some evidence showing that it served as a highway for migration." (2) "There is some evidence of migration from South America to Australia, but at present no evidence of a counter movement to South America." (3) "Nothing in the dis-

tribution of mollusks would lead to the hypothesis that South Africa has ever been connected with Antarctica and thereby indirectly with southern South America." It is finally concluded that "the South American molluscan fauna is traceable to two sources: an ancient southern continent lying across the south Atlantic and enduring from at least Palæozoic to near the end of Cretaceous time, and to Miocene and Pliocene to recent connections with the middle American area." Since the appearance of Dr. Pilsbry's work, Dr. Ortmann has published the anatomy of the Australian fresh-water mussel *Hyridella,* showing that it is indeed allied to the South American *Diplodon,* further suggesting communication between these areas. All these matters no doubt deserve fuller discussion. According to Dr. Schuchert's recent map, North America was rather broadly continuous with South in the late Comanchic period, and remained so during the Cretaceous. During the early and middle Tertiary this connection was interrupted; but with the coming of the Pliocene, according to Dr. H. F. Osborn, it was renewed, and has continued to the present day. There should be, therefore, two elements in the neotropical fauna, both derived from the north, one of Mesozoic age, the other late Tertiary. The latter is recognized by Dr. Pilsbry, but where is the former? Is it not, at least in part, the "Eogæic" group of families? Is there anything in the Molluscan fauna which really supports the idea of a gigantic Gondwana continent, or any other body of land crossing the Atlantic or Pacific? It is true that molluscs are likely to travel slowly, the pace of the snail is proverbial; but they are ancient and have had time enough. *Cochlicopa lubrica,* assuredly a member of a Palæarctic group, has contrived to crawl all the way from the old world to New Mexico within the lifetime of its specific type, the animal being quite the same in Europe as in America. There is surely nothing in the distribution of snails which might not be explained by migrations from the north, and as to the negative evidence based on northern palæontology, it is clearly not worth much. As Dr. Pilsbry truly says, "the rarity of land and fresh-water shells as fossils, and the great antiquity of the family groups, renders the question very intricate." On the other side, there is the fact that the Chilinidæ, certainly of no recent origin, have apparently never left South America. There are reasons for thinking that in Palæozoic times the Antarctic land mass supported a more or less luxuriant flora, with a corresponding fauna, which doubtless eventually spread in part to other regions of the earth.[1] It is even possible that the Chilinidæ came from this source; but we can hardly expect to find much, if any, clue to the components of this antarctic biota in the *present* distribution of life, for the simple reason that there has been abundant time for it to spread over the whole earth, wherever the conditions permitted.

With regard to the northern route from South America to Africa or Australia, or *vice versa,* it should be clearly understood that it is not necessary for a whole fauna to migrate, to account for such faunal resemblances as exist. Thus the Characinid fishes are to-day abundantly represented in the Ethiopian and Neotropical regions, but do not exist elsewhere except that one or two species enter the southwestern part of the nearctic. No fossil Characinids have been found in the north. The naïve conception of a transatlantic bridge on which the Characinids freely traveled appeals to the imagination, but it is found on examination that only one part of the African Characinid fauna is really at all close to the South American, while the latter has very important elements totally diverse from the African series. The indications are that the Characinids arose in the neotropical, and at some very remote period reached Africa, where they developed a type (Ichthyoborinæ + Distichodontinæ, probably to be regarded as a distinct family Distichodontidæ) entirely unique in some of its characters. At a much later time the Hydrocyonine Characinids appear to have arrived in Africa, the immigrants consisting perhaps of not more than one or two species, which during a relatively brief period overran the northern hemisphere, leav-

[1] See, for instance, Seward, *Quarterly Journal Geological Society,* August, 1897, pp. 335–338.

ing perhaps no fossil remains which will ever be detected.[2]

T. D. A. Cockerell
University of Colorado

## SPECIAL ARTICLES

### NOTE ON THE UPPER EOCENE TITANOTHEROID TELMATHERIUM (?) INCISIVUM DOUGLASS FROM THE UINTA BASIN

In describing the type of this species (a skull, No. 2,398 Carnegie Museum Catalogue of Vertebrate Fossils) Mr. Douglass[1] said:

I think that this skull represents a different genus from *Telmatherium*, but I prefer to place it provisionally here rather than establish another genus.

Through the courtesy of Mr. Douglass, Director Holland and Professor Osborn, the present writer has been enabled to compare this type with the extensive Eocene Titanothere material in the American Museum of Natural History. With the approval of these gentlemen the species *Telmatherium (?) incisivum* Douglass is hereby made the type of a new genus or subgenus *Sthenodectes*.[2] This genus is distinguished from *Telmatherium ultimum* Osborn by the following assemblage of characters: (1) The incisors are far larger and more advanced in evolution, $i^1$ being closely appressed to its fellow in the median line, with anterior face elongate, anterointernal tip blunt, median basin large, posterior wall or cingulum very massive; $i^2$, $i^3$ extremely large with low recurved tips and very heavy posterior cingula. (2) The postcanine diastema is reduced or absent. (3) Superior premolars 2, 3, 4 are much more advanced than in *T. ultimum*, having very heavy internal cingula, pronounced external cingula, high slender internal cusps (deuterocones); $p^2$ especially is in a relatively advanced stage, as compared with *T. ultimum*. (4) The least transverse diameters of $p^4$ and of the anterior lobe of $m^1$, are greater, that of $m^3$ much less, than in *T. ultimum*. (5) The basicranial region differs in many details, such as the apparent junction of the post-glenoid and post-tympanic processes below the auditory meatus. (6) The occiput is low with a sharp, long, sagittal crest. (7) The forehead is relatively wide. (8) The nasals taper distally.

From *Manteoceras* (especially *M. uintensis*) the genus under consideration is distinguished by: (1) The form and size of the incisors and canines, (2) the much more advanced stage of evolution of the premolars, (3) the shorter anteroposterior diameter of $m^2$, (4) the reduction of the post-canine diastema, (5) the arched and spreading zygomata; etc.

From *Dolichorhinus* and *Mesatirhinus* it is separated by the shortness and relative breadth of the skull, the great size of the incisors, the relatively heavy zygomata and many other details.

The genus or subgenus *Sthenodectes* is apparently allied to *Metarhinus* and may well be related to *Metarhinus earlei* Osborn from the Upper Washakie, which it resembles in important characters of the premolars and molars, form of the basis cranii and occiput, marked constriction of the face in front of the orbits as seen from above. The narrow tapering nasals and other characters also suggest affinity with *Metarhinus diploconus*. The type skull of *Sthenodectes incisivum* differs from all known *Metarhinus* material in the form and in the very large size of the incisors and canines, in the much stronger internal cingula on the premolars, stout zygomata, junction of the post-glenoid and post-tympanic processes below the auditory meatus. The forms of the premaxillary and of the subnasal incisure also differ from those of *Metarhinus*. The supposed vacuities in the lachrymal region, although indicated on both sides, may be artifact.

William K. Gregory

### OIL CONCENTRATION ABOUT SALT DOMES

In several national, state and private publications the writer has called attention to the remarkable concretionary growth and bodily

[2] The Cichlidæ, with a very similar distribution, have left us beautifully preserved fossils of Eocene age in Wyoming, but not elsewhere.

[1] *Ann. Carnegie Mus.*, Vol. VI., No. 2, 1909, p. 305.

[2] σθένος, strength, δηκτήs, a biter, in allusion to the great power and development of the incisors and canines.

movement upwards of huge masses of rock salt in Cenozoic deposits along the Gulf border. The bearing of the structures produced in the neighboring beds by such growths and movements on oil concentration was duly set forth in Bulletin 429 of the United States Geological Survey. Recently he has had the opportunity of testing the value of his "dome theory" for locating oil "pools" in a region far away from any known oil occurrences. Reference is here made to Pine Prairie, south central Louisiana, where the Myles Mineral Co. has had the courage to try out the theory and has discovered by the means a new oil field. The director writes "I consider this a most remarkable vindication of a theory originated by you, and we attribute a large measure of our success thus far to your advice."

Space should not be taken here to discuss the probable exact location of oil in connection with these domes; that is a matter depending largely on the approach of the salt dome to the surface, size, location, etc. These matters have been outlined at least in the U. S. Geological Survey Bulletin already referred to. But the location of oil by means of a theory unheard of ten years ago does seem worthy of record at this time. Another fact that should be impressed upon the mind of the public now is the absolute worthlessness of stock in companies putting down wells "near" the discovery well. This matter has, however, been discussed in Bulletin 429.

G. D. HARRIS

CORNELL UNIVERSITY

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## *THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SECTION D*

DR. J. A. HOLMES, director of the Bureau of Mines, was elected vice-president of the association and chairman of Section D for the next meeting, at Cleveland. Professor O. P. Hood was elected a member of the council for the Cleveland meeting and Major W. W. Crosby a member of the sectional committee for five years, *vice* Professor J. E. Boyd, whose term expired. Mr. W. Bowie represented the section in the general committee.

The meetings of the section were presided over by Vice-president C. S. Howe, of Cleveland. The section held its first session on Wednesday morning, December 27, at Georgetown Law School. Two sessions were held on Thursday at the same place. On Friday morning and afternoon the section met in the Institute for Industrial Research. On Saturday, visits of inspection, under the direction of Professor A. H. Blanchard, were made to the office of good roads and to the sites of actual road construction in the vicinity of Washington and Baltimore.

On Thursday afternoon, following the address of retiring Vice-president A. L. Rotch, the following resolutions were adopted:

WHEREAS, the new and important art of navigating the air requires for its proper development exclusive investigations in aerodynamics, and thorough comparative tests of practical aerial machines, and

WHEREAS, the Aero Club of America proposes to secure the endowment of a laboratory for such investigations and comparative tests, therefore be it

*Resolved*, That the Engineering Section of the American Association for the Advancement of Science expresses to the Aero Club of America its appreciation of the urgent need for such a laboratory, and heartily commends its efforts to secure an adequate endowment, and be it further

*Resolved*, That a copy of these resolutions be sent to the Aero Club of America, with best wishes for the success of its efforts.

On Friday afternoon, resolutions were adopted extending the thanks and appreciation of the section to Dr. A. S. Cushman, director of the Institute for Industrial Research, for the use of the laboratory for the meetings on that day. The secretary takes this occasion to express his appreciation of the valuable assistance of Dr. C. S. Howe and Professor A. H. Blanchard in securing papers for the program and to the members and non-members who contributed.

The Washington meeting of Section D was successful beyond expectations, the papers being valuable and interesting and the attendance at the sessions encouraging as to numbers and interest manifested.

Abstracts and titles are listed below by groups.

### MISCELLANEOUS PAPERS AND TITLES

*Analysis of the Deflections and Stresses in Reinforced Concrete Floor Slabs Constructed on*

*the Turner Mushroom System:* H. T. Eddy, University of Minnesota.

Owing to the apparently irregular distribution of the reinforcement employed in this system and to the uncertainty as to the value of Poisson's ratio or lateral contraction for reinforced concrete, engineers have differed widely in their estimates of the strength and stiffness of this form of construction, and have distrusted the results of tests made to determine deflections. The author has in this paper given a complete rational analysis of this form of construction and derived simplified but closely approximate practical formulæ for the resistance and deflection of this slab, showing how the various constants depend upon the properties of the materials composing the slab and how their arrangement affects its strength and rigidity. Of these several constants Poisson's ratio is the most important. It is shown in the paper that the value of Poisson's ratio obtained from experiments upon ordinary test specimens of square or round cross section is necessarily much too small for material circumstanced as is the reinforcement in a slab. The experimental results obtained from the deflection of mushroom slabs makes it probable that the proper value of Poisson's ratio for the reinforcement is nearly twice that obtained from ordinary test specimens. On this basis the theoretical results arrived at in the paper agree in a very striking and remarkable manner with the empirical formulæ which have been proposed to express the results of the numerous tests heretofore made on such slabs.

*The Primary Triangulation System of the United States; its Extent and Uses:* William Bowie, U. S. Coast and Geodetic Survey.

This paper shows that extended areas can not be accurately controlled by a number of disconnected local trigonometric surveys, owing to the deflection of the vertical (or the station error) at the astronomic stations which control the positions of the several schemes of triangulation. The primary triangulation, on the other hand, is continuous and no discrepancies will be shown between detailed surveys based upon it. The positions of objects shown on maps, charts and surveys based on the U. S. Standard datum will probably never be changed. Examples are cited of the use of trigonometric surveys by the United States and Canada Boundary Survey, by the state of Maryland in its oyster survey, by the Isthmian Canal Commission, by the city of New York and by the Clinchfield Coal Corporation in Tennessee. It is planned to extend the primary triangulation into new areas as readily as possible, and it is hoped that, eventually, no place in the United States will be more than 150 miles from some primary station.

*Curved Line Vernier Method:* H. E. Wetherill, Philadelphia. Read by title.

*Differentiation of Saturated Vapor Engines:* J. E. Siebel, Chicago. Read by title.

PAPERS ON THE WORK OF THE BUREAU OF MINES

*In Relation to Gas Producers and Internal Combustion Engines:* R. H. Fernald, Case School of Applied Science.

The investigations show that practically every shipment of fuel tested in the gas producers, including coals as high as 44 per cent. ash, and lignites and peats high in moisture, has been successfully converted into producer gas which has been used in operating gas engines. It has been estimated that on an average there was developed from each coal tested in the gas producer plant two and a half times the power developed when used in the ordinary steam-boiler plant, and that such relative efficiencies will probably hold good for the average plant of moderate power capacity, though this ratio may be reduced in large steam plants of the most modern type. It was found that the low-grade lignite of North Dakota developed as much power when converted into producer gas as did the best West Virginia bituminous coals when utilized under the steam boiler; and in this way lignite beds underlying from 20,000,000 to 30,000,000 acres of public lands, supposed to have little or no commercial value, through these investigations have been shown to have a large value for power development and the money value of the government's own property has been increased to the extent of probably $300,000,000 or more. The investigations into the waste of coal in mining have shown the enormous extent of this waste, aggregating from probably 200,000,000 to 300,000,000 tons yearly, of which at least one half might be saved. It is being demonstrated that the low-grade coals high in sulphur and ash now being left underground can be used economically in the gas producer for power and light and should, therefore, be mined at the same time that the high-grade coal is being removed. The use of these low-grade fuels, which have previously been regarded as of little or no value, increases our fuel resources approximately (on the basis of present marketable grades): low-grade bituminous and anthracite, 75–100 per cent.; sub-bituminous, lig-

nite and peat, 60 per cent; or roughly, total increase of 150 per cent. over our present supply of marketable grades of fuel. The logical conclusion from a careful study of the producer gas power situation is that the time is not distant when financial interests in power production will be directed toward the centralization of the producer-gas power plant at the mines and the distribution of the energy developed either by high-voltage long-distance electrical transmission or by pipe systems for conveying the gas.

*Investigations in Relation to Fuels and Fuel Efficiencies:* O. P. HOOD and S. B. FLAGG, Bureau of Mines.

The Bureau of Mines is engaged in investigating the general problem of the conservation of our mineral fuels by careful study of the problems of preventing waste in mining transportation and storage and of increasing the efficiency with which the fuel is finally used for heat, power, etc., and also the problem of utilization of inferior fuels not now generally used, owing to ignorance as to their value and the means of making that value available. The study of the problem of combustion for steam and for gas engines was inaugurated on a large scale in 1904, and is still in progress. At present the combustion of fuel for steam purposes is being examined in a specially constructed furnace permitting of the determination of temperatures and chemical composition at short intervals between the fire and the stack, and the values of refuse collecting at mines and in yards, and of lignite, peat and miscellaneous wastes from various industries, as fuels for the producer gas engine are being carefully investigated. Also the advantages of briquetting for rapidly deteriorating fuels, the best methods of transportation and storage, the prevention of mine explosions, spontaneous combustion and smoke are receiving careful attention. The purchase of fuel on the basis of specifications covering heat value and composition with penalty and premium provisions has been materially advanced by the bureau. The investigations of the bureau have been favorably received and the results in application by fuel producers and users have been gratifying and encouraging to further work.

*With Special Relation to Safety in Mining, Quarrying and Metallurgical Operations:* J. A. HOLMES, Director, Bureau of Mines.

The main purpose of the bureau is to increase health and safety in the mineral industries. It is endeavoring to collect statistics relating to accidents and health conditions in and about mines, quarries and metallurgical plants, and is investigating the causes of accidents and the conditions inimical to health and safety. One of the most important investigations is that of the cause of mine explosions, which involves a study of mine gases and coal dust and the conditions under which inflammable gases and dusts may be ignited. A related investigation, that of explosives used in coal mining, was undertaken to determine what explosives are least likely to ignite gases or coal dust. Another investigation deals with the prevention of accidents from electrical equipment in mines. The miscellaneous accidents in mines, including falls of roof, are also being investigated. These miscellaneous accidents, though individually small, each year kill more miners than the great explosions. The mine-rescue and first-aid work of the bureau has attracted more attention than its investigations. The bureau now has six mine-rescue stations and seven mine-rescue or mine-safety cars in the more important coal fields of the country. The work of these stations and cars is largely educational, training miners in mine-rescue and first-aid methods and demonstrating equipment and appliances. More cars and more equipment are needed. It is expected that within a few years the bureau will have trained 20,000 miners, who will be organized into local mine-rescue and first-aid corps, to be supported without aid from the federal government. The success of the bureau's work in behalf of safety will depend on how far this work receives the cooperation of mine owners and miners. The federal government can conduct investigations, the states can embody the results of these investigations in laws, but the cooperation of mine owner and miner are essential to success. The progress in lessening accidents is slow and there is serious need for extending the work of the bureau. Its investigations hitherto largely confined to the health and safety problems about coal mines, should cover similar problems at metal mines, quarries and metallurgical plants.

PAPERS ON AERONAUTICS AND AERIAL ENGINEERING

*Holes in the Air:* W. J. HUMPHREYS, U. S. Weather Bureau.

Aeronauts have adopted the picturesque phrase, "holes in the air," to describe that condition of the atmosphere that makes uniform horizontal flight impossible, and causes great danger to the aviator. Among the atmospheric conditions that may cause a greater or less drop of the aeroplane

are (*a*) horizontal strata moving with different velocities, (*b*) columns of air with different vertical components. The boundary between such strata and columns often is quite narrow, and hence the aviator may pass with disconcerting abruptness from one to the other. On certain conditions the downward acceleration may be even in excess of that due to gravitation and thus the aviator thrown out of his seat.

*Aeronautical Screw Propellers:* Spencer Heath, Washington.

The author discussed the propeller as a transmitter of power, the losses of efficiency due to slip and skin friction. He explained the design of the propeller on the principle that each section is an aerofoil traversing a helical path and deduced the formulæ for slip, pitch, thrust, speed and lost power, with applications to two specific cases. The paper was illustrated with numerous diagrams and full-size propeller blades.

*Revolving Cylinder Aerial Motor:* Emil Berliner, Washington.

Under this title, the speaker described the principle of design and construction of a new type of gasoline engine for propelling aircraft. This is made in two sizes and so designed and built as to give considerable power and good running balance.

*Work of the Signal Corps in Aeronautics:* G. O. Squier, Signal Corps, U. S. A.

The speaker gave a description of the work which has been done by the signal corps of the U. S. Army in the study of the prospects of the aeroplane for reconnaisance and dispatch work. A training school for members of the signal corps is established and a number of recruits are enrolled.

*Endowment, Organization and Equipment of Aerodynamic Laboratories:* A. F. Zahm, Washington.

Definition, functions, scope of aeronautic and aerodynamic laboratories. Bearing on the development of aeronautic science, art and industry. Endowment, organization and equipment of the Institut Aerodynamic de Koutchino, of the Aerodynamical Laboratory of the University of Göttingen, the Institute Perotechnique de St. Cyr, Eiffel's Aerodynamic Laboratory, etc. Methods of experimentation and results obtained in various laboratories. Aero Club of America's movement to secure the endowment of a national aeronautic laboratory.

*Aerial Engineering:* A. Lawrence Rotch, Blue Hill Observatory.

Vice-presidential address, published *verbatim* in Science, January 12, 1912.

PAPERS ON ROAD AND HIGHWAY ENGINEERING

*History of Washington Bituminous Concrete Pavements:* Martin Brooke, Washington.

Bituminous concrete pavement was first laid in Washington in 1871, since which date over a million square yards have been laid. Eight hundred thousand square yards are still in existence, less than two hundred thousand yards of which are in the original form. Between 1871 and 1878 half a dozen different types of patented bituminous concrete pavements were laid, a considerable portion of which were unsatisfactory and required resurfacing within a few years. The best of them, however, were fairly durable and economical, and some have continued in use to this day. These pavements were characterized by their thickness and density and by the quality and amount of the tar and tar-asphalt binder used. Bituminous concrete was abandoned in 1878 for sheet asphalt on hydraulic cement base, until 1888, when the inability to obtain bids for the latter type within the legal limit of two dollars per square yard set by Congress compelled the reintroduction of bituminous concrete. The pavements of this character laid between 1888 and 1893 under District of Columbia specifications were cheaper pavements than the old type, and the tar distillate binder used was decidedly inferior to the old tar. Since 1909, a bituminous macadam has been laid in suburban streets, which is very similar to the bituminous concrete pavement laid in the seventies.

*History of Tar Concrete Pavements in Ontario:* W. A. McLean, Toronto.

The first tar-concrete pavement in Ontario (Canada) was laid in Hamilton in 1880, a part of which is still in use. During the years 1889–1906 numerous tar-macadam pavements were laid in seven cities of the province, aggregating about 25 miles. Except in the city of Guelph, the use of commercial coal tar has been displaced by refined tar or other proprietary bitumens. The general experience was that for the first three years the surface has been satisfactory; in five years the surface coat, if not renewed, was worn away in spots; at the end of ten years the surface was generally rough and disintegrated, but still protected the foundation. In Hamilton and Toronto the tar macadam after five or ten years has been protected by a wearing surface of sheet asphalt, from one to two inches in thickness. Experience has indicated that tar of uniform quality and of composition within certain range of proportions, while susceptible to extremes of temperature, is not debarred by climatic or other conditions, as

a useful road material; that best results require a dense mixture, preferably proportioning the aggregate for maximum density; that some doubt may be attached to the complete durability of bituminous surfaces made by the penetration process, and suggesting that the grading of stone in this method, rather than having a uniform size, is desirable; that a moderately coarse aggregate should be brought to the surface, to overcome slipperiness and take up wear; that tar-concrete is less durable under concentrated wear than is sheet asphalt; that broken stone will provide a more stable structure than will water-rounded gravel when bonded by tar; that a paint and grit coat is necessary as a preservative as frequently as signs of surface wear or oxidation appear.

*Surface Treatment of Park Roads:* SPENCER CROSBY, Washington.

In building and rebuilding park roads in Washington in the last few years a heavy oil or tar binder, applied by the penetration method, has been used with most satisfactory results. For the surface treatment of existing macadam roads, emulsions, waste sulphite liquors, coal gas and water gas tars, and asphaltic oils have been experimented with and last have been found to give best results. One application per year is sufficient to keep the surface in excellent condition. During the last fiscal year 166,000 square yards of park roads were given surface application of oil or tar at an average cost of 2½ cents per square yard, not including cost of screenings. This compares with an average cost of 3.2 cents per square yard for watering in previous years.

*Oyster Shell Roads:* W. W. CROSBY, Johns Hopkins University.

General remarks on arguments for and limits to use of shells for road purposes. Descriptions of results in Maryland. Particular points to be observed in construction and specifications recommended. Use of bituminous material in connection with shells. Costs of construction and of treatment with bitumen. (Six photographs showing shell roads treated and untreated.)

*Changes in Pitch under Exposure and Traffic:* W. W. CROSBY.

Description of construction and analysis of tar used. Description of traffic conditions and record of traffic census. Description of results apparent. Analysis of tar surface after three years of use and of tar extracted from samples of this surface. Conclusions as to changes in tar that have apparently occurred.

*The Chemistry of Modern Highway Engineering:* PREVOST HUBBARD, Institute for Industrial Research.

The necessity of chemical training for modern highway engineers is discussed at some length, and an outline is given of what the author believes to be the essentials of such training. Columbia University has already made the chemistry of road materials a part of its new post-graduate course in highway engineering. It is believed that this training will establish closer relations between the highway engineer and the chemist. Modern conditions demand the work of specialists in highway construction as in many other branches of engineering, and it is not reasonable to expect that the man whose training has been primarily developed along engineering lines can satisfactorily apply the principles of other highly specialized subjects to his work without the assistance of those who have specialized in such subjects. Therefore, the highway engineer should not attempt the chemical testing of road materials, but should cooperate with the chemist in this matter.

*A Review of the Use of Bituminous Materials in the Construction and Maintenance of American Highways during 1911:* A. H. BLANCHARD, Columbia University.

The following table shows the characteristic developments in the use of bituminous materials during the years 1908, 1909, 1910 and 1911 under the supervision of the highway departments of Maine, New Hampshire, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania and Maryland. The quantities are square yards.

SURFACE TREATMENT OF ROADS

| Tars and Tar-Asphalt Compounds | Fluxed Native Asphalts Oil Asphalts and Residual Asphaltic and Semi-asphaltic Oils | Light Oils |
|---|---|---|
| 1908. 57,700 | 1908. 239,500 | 1908..... |
| 1909. 95,500 | 1909. 910,600 | 1909.4,125,900 |
| 1910.123,400 | 1910.2,434,200 | 1910.9,890,400 |
| 1911.433,000 | 1911.7,980,000 | 1911.3,765,000 |

BITUMINOUS PAVEMENTS CONSTRUCTED BY PENETRATION METHODS

| Tars and Tar-Asphalt Compounds | Fluxed Native Asphalts Oil Asphalts and Residual Asphaltic and Semi-asphaltic Oils | Light Oils |
|---|---|---|
| 1908.. 37,800 | 1908.. 25,200 | 1908..... |
| 1909..170,200 | 1909..2,077,400 | 1909..... |
| 1910..339,300 | 1910..4,840,200 | 1910..26,500 |
| 1911..122,000 | 1911..8,600,000 | 1911..... |

BITUMINOUS PAVEMENTS CONSTRUCTED BY MIXING METHODS

| Tars and Tar-Asphalt Compounds | Fluxed Native Asphalts Oil Asphalts and Residual Asphaltic and Semi-asphaltic Oils | Light Oils |
|---|---|---|
| 1908.. 52,100 | 1908.. 4,400 | 1908..... |
| 1909..136,000 | 1909..219,500 | 1909..... |
| 1910..158,000 | 1910..432,600 | 1910..... |
| 1911.. 24,350 | 1911..508,100 | 1911..... |

The most important developments during 1911 were as follows: the increased use of the mixing method of constructing bituminous concrete pavements due to the introduction of economical and efficient mixing plants and less fear of injunction and law suits brought by patentees; the manufacture of many types of gravity and pressure distributors for use in the construction and maintenance of bituminous surfaces and bituminous pavements built by penetration methods; the demand by many engineers for bituminous materials for bituminous surfaces which will set up in from 24 to 48 hours; increase in recording scientific data such as recommended by the special committee on the Use of Bituminous Materials of the American Society of Civil Engineers.

*Organization of a Highways Maintenance Bureau of a Municipality:* W. H. Connell, New York City.

It is, in the writer's opinion, desirable in the organization of a Highways-Maintenance Bureau to follow the theory of centralization of control. First comes the planning of an organization adapted to the needs of the municipality, then the proper control of the same, which can only be accomplished through the appointment of men especially qualified to supervise the work of the various branches of the organization. The responsibility of course should be centered in one man, and he should be familiar with the social conditions of the municipality and keep in close touch with the activities of the divisions under his control. All work should be initiated through job orders and unit cost records kept of the same. All street repairs, etc., should be done by the highways-maintenance force. All repairs to pavements between railway tracks over corporation cuts, etc., should be done through and under the supervision of the Highways-Maintenance Bureau. This procedure centralizes the responsibility and control of work coming under the jurisdiction of said bureau.

*Utilization of Motor Truck Trains in the Maintenance of Truck Highways:* L. W. Page, Office of Public Roads.

The object to be accomplished is the development of an automobile equipment which will include all the apparatus and facilities necessary to efficiently employ a repair gang of eight men in the maintenance of road surface over one hundred miles of roadway or more as the working conditions will permit. This purpose as set forth has three significant implications: First, that the cost of the equipment should be kept consistently low or within the range of customary expenditures in this direction; second, novel or especially manufactured apparatus should be avoided so that the equivalent apparatus can be secured in any locality, and, further, that existing investment in similar details of equipment can be made use of; third, that the outfit should be so flexible in its makeup as to readily serve a variety of utility or lend itself to peculiar requirements under varying conditions. In performing service in road repairing, the machine should incorporate as many of the requirements of a portable power plant as possible, such as hoisting, pumping, and, where necessary, air compression and power-shaft driving. The automobile chassis selected for recommendation is the 5-ton gas-electric type manufactured by the Couple-Gear Freight Wheel Company, Grand Rapids, Michigan. This chassis is fitted with a Sprague electric hoist, which can be used for a variety of purposes. The motor of this hoist is directly connected to a rotary pump which can be used to furnish bituminous material from a tank carried on the machine through a distributing device permanently attached to the rear of the chassis. An electric air compressor and a power sweeper could also be attached to the machine. The chassis can be fitted with a removable platform body, with or without stakes or side racks; and it may also be fitted with a steel dumping body, the forward half of this body to be fitted with removable partitions to provide spaces of one or two cubic yards capacity for carrying different sizes of road material. The rear half of the body may be used for carrying the bituminous heating tank. Seats for four men and spaces for tools are provided between the dumping body and the driver's seat. The latter is made wide enough to carry three men beside the driver. It would be impossible to use standard wagons as trailers for carrying material, and a sprinkling wagon or bituminous tank mounted on its own wheels could also be carried behind the tractor. It would prob-

ably be necessary to establish supply stations at intervals along the road to be maintained with this equipment.

*Underground Pipe Construction in Streets:* C. E. BOLLING, Richmond, Va.

Much money could be saved in street construction and maintenance if pipe systems, such as for water, gas, sewer, etc., were laid before the surface of the roadway was constructed. All main pipes should be placed and connecting pipes laid to each lot, whether the latter are occupied or vacant. The estimated annual cost on such connections, assuming a 4 per cent. interest on the outlay, is 96 cents. The rapid rate of growth of communities so improved is marked. The increased value of abutting property, due to the conveniences obtained, creates tax receipts generally in excess of this annual interest. The cost of making pipe connections through improved roadways is at least 60 per cent. greater than through unimproved ones, and the cost of restoring and maintaining the pavement is doubled.

*Impact Testing Machine for Pitch:* W. H. FULWEILER, Philadelphia.

This apparatus was designed to determine the relative binding qualities of bituminous materials used in road construction and maintenance. The material to be tested is enclosed as a thin film between two steel dies. The dies are designed to avoid the effect of suction. An excessive breaking load is applied by the impact of a falling weight, and the resistance to rupture of the film is recorded by a spring balance provided with a maximum indication hand. This form of apparatus may be used to compare the binding qualities of any grade of material. In a modification of this apparatus a pendulum in falling separates the dies, and automatically records the energy absorbed. The results obtained have not yet been completely analyzed, but apparently they will serve to differentiate classes of materials and indicate the most effective viscosity of any material for road use.

*Centrifugal Method for the Determination of Free Carbon:* W. H. FULWEILER.

This method was designed to afford rapid and reasonably accurate results to obviate the danger of handling carbon bisulphide in the laboratory. The material is weighed with a stoppered Goez phosphorus tube dissolved in $CS_2$ with shaking and centrifuged until the precipitate ceases to contract. The percentage may then be read off directly. The tubes are calibrated for the particular class of material to be tested by reference to standard samples. Care must be taken to keep the tubes scrupulously clean. The lower the percentage of free carbon the closer this method checks with the ordinary gravimetric method. In this method the carbon bisulphide is not exposed to the air and considerably smaller quantities are required.

*Cost of Road Building with Convict Labor:* J. H. PRATT, Chapel Hill, N. C.

The author has not submitted abstract.

The following papers in this group were read by title in the absence of authors and manuscripts:

*Street Asphalt Paving Mixtures, and Value of Blown Asphalts and their Manipulation:* H. B. PULLAR, Chicago.

*Organization of the Engineering Department of Coleman du Pont Road, Inc.:* F. M. WILLIAMS, Delaware.

*Organization of Convict Labor on the Virginia State Highways:* P. ST. J. WILSON, Richmond, Va.

*Some Limitations of Distributing Machines:* H. B. DROWNE, Columbia University

*Voids in the Aggregates of Bituminous Concrete Pavements:* A. H. BLANCHARD, E. R. DONLE and C. M. HATHAWAY, Columbia University.

It is expected that the papers of this group will be published in book form at an early date.

G. W. BISSELL,
*Secretary*

## SOCIETIES AND ACADEMIES

### THE HELMINTHOLOGICAL SOCIETY OF WASHINGTON

THE seventh regular meeting of the society was held at Dr. Ransom's residence on December 19, 1911, Dr. Ransom acting as host and Mr. Crawley as chairman.

Dr. Pfender presented a brief note on the desirability of zoologists and medical men using *Treponema* rather than *Spirochæta* for the organism causing syphilis.

Mr. Foster presented the following note:

*Analysis of the Results of 87 Fecal Examinations of Sheep Dogs for Evidences of Parasitism.*

Order No. 176 of the Bureau of Animal Industry requires that all collie or sheep dogs imported to this country shall be held in quarantine pending the result of a fecal examination to determine the presence or absence of the gid tapeworm. As it is difficult to distinguish the eggs of the gid tapeworm from those of other less injurious species, all dogs found infested with tapeworms are given a suitable tæniafuge.

Since November 25, 1910, when this order went

into effect, the feces of 87 dogs have been examined. Of these, 50 dogs, or about 57 per cent., were infested with parasitic worms. Of the 50 dogs thus parasitized, 28 were infested with nematodes only, while 22, or about one fourth of the dogs examined, were infested with tapeworms, either of one species only, of two or more species, or of tapeworms and nematodes.

Of the 22 dogs infested with tapeworms, there were

7 infestations with *Tænia hydatigena*,
8 infestations with *Tænia pisiformis*,
4 infestations with *Dipylidium caninum*,
2 infestations with *Multiceps serialis*,
8 infestations with unidentified *Tænia*.

This is a total of 29 infestations with tapeworms, representing four recognized species. The number of infestations is of course greater than the number of dogs infested, since in several cases one dog proved to be the host of two or more species.

The heaviest infestation recorded, from 14 to 19 specimens of tapeworms, representing three species, was as follows:

| | Specimens |
|---|---|
| *Tænia hydatigena* | 6 |
| *Tænia pisiformis* | 3 |
| *Dipylidium caninum* | 5–10 |

It will be seen from the foregoing that *T. hydatigena* is the tapeworm which was most frequently found. Out of 37 identified specimens, this species occurred 13 times, 35 per cent. of the specimens identified being of this species. *D. caninum*, although found in but 4 infestations, comes next in number of specimens found, *i. e.*, 12. There were 8 infestations with *T. pisiformis*, with a total of 10 specimens, while only 2 specimens of *M. serialis* were found and in both cases the identification is uncertain.

Of the 87 dogs examined,

9.2% were infested with unidentified tapeworms,
9.2% were infested with *Tænia pisiformis*,
8.1% were infested with *Tænia hydatigena*,
4.5% were infested with *Dipylidium caninum*,
2.3% were infested with *Multiceps serialis*.

It is interesting to note what a small per cent. were infested with *D. caninum*, which is usually considered the commonest dog tapeworm. In all the species considered in this paper, the percentage of infestation is far lower than the average given in the comparative table of Stiles, 1898 ("Inspection of Meat for Animal Parasites," p. 105). The writer is inclined to think that the small percentage shown in the examination of imported dogs is the result of the greater care bestowed on valuable animals such as these are.

Mr. Leonard read a paper entitled "Some Abstracts from Investigations on Parasitic Diseases Carried on at the Marine Hospital, Wilmington, N. C." The paper showed the percentage of infection of man with various intestinal parasites as determined by 688 microscopic examinations.

Mr. Hall presented the following note:

*Notes on the Parasite Fauna of Colorado.*

The writer has recently compiled a list of the parasites of animals in the state of Colorado, the list covering published records, material in the collections of the Bureau of Animal Industry, the National Museum, the Hygienic Laboratory, the Naval Medical School, and some records furnished by workers in various colleges. Most of the Bureau of Animal Industry specimens from Colorado were collected by the writer during the past summer.

Using the word *identified* to indicate at least a generic identification, the list includes at present a total of 251 identified and 27 unidentified species of protozoan, trematode, cestode, nematode, crustacean, mallophagan, hemipterous, dipterous, siphonapteran, arachnid and annelid parasites.

Among the interesting and apparently new species collected by the writer during 1911 may be mentioned a *Rictularia* and a *Tænia* resembling *T. pisiformis* from *Canis nebracensis*, and a *Chabertia* from *Thomomys fossor*.

One case of hookworm found by Dr. Webb, of Colorado Springs, in a patient from the south is of interest in that it suggests that with carriers of hookworms entering the state, the disease is likely to get a foothold, especially in southern Colorado. In fact, it is likely that an examination of the Mexican miners in southern Colorado, where the climate and the mode of life in the Mexican section of some mining towns is favorable to hookworm development, would be repaid by positive findings.

The collection of a species of *Anopheles* by G. P. Weldon in Delta County is of interest, as this is the first record of this genus from Colorado, according to Professor Gillette, who furnished the writer with the record. In his opinion, we have here the explanation of an outbreak of malaria on the western slope of Colorado.

The occurrence of what Stiles calls *Dermacentor andersoni* and Banks calls *D. venustus* has been reported from ten counties in Colorado by Hunter and Bishopp (1911). It was first reported from Colorado by Banks (1895), under the name of

*Dermacentor americanus.* As the carrier of Rocky Mountain spotted fever, this tick is of especial interest at present.

Dr. Ransom presented some figures illustrating the life history of *Habronema muscæ* and showing stages in the fly and in the horse. A note on this life history has already been published in SCIENCE.

Dr. Ransom presented the following note:

*The Occurrence of Cheilospirura hamulosa in the United States.*

The nematode *Cheilospirura hamulosa* is parasitic in the gizzard of the chicken. A record of the occurrence of this species in the United States has apparently not been published heretofore. The helminthological collection of the Bureau of Animal Industry contains specimens collected in Kansas in 1897, identified by Stiles and Hassall; in New Jersey in 1903, identified by Ransom; in Hawaii in 1907, identified by Hall and Hassall; in the District of Columbia in 1908 and 1909, identified by Hall; in Ohio in 1911, identified by Graybill, and in Indiana in 1911, identified by Ransom.

Dr. Pfender presented the following note:

*Symptoms Accompanying an Infection with Tænia saginata.*

Recently one of the writer's patients, a woman 54 years old, presented herself for treatment and complained of the following symptoms: itching all over the body, skin eruptions, recent trouble with cold feet, twitching of lower limbs, nausea, no desire for food, excessive bloating, flatus, occasional dizziness and excessive leucorrhea. She complained that pieces of worm, from 3 to 30 at a time, were being constantly passed. On treatment with oleoresin of male fern the worm was passed. Since then the nervous and digestive symptoms have entirely disappeared and the general health is improving.

THE eighth regular meeting of the society was held in the rooms of the Zoology Division of the Marine Hospital Service, January 11, 1912, Dr. Stiles acting as host and Mr. Foster as chairman.

Dr. Garrison exhibited a specimen of pancreas sent in by Assistant Surgeon Kerr, U.S.N., from Guam. The pancreas had a specimen of *Ascaris lumbricoides* in the duct of Wirsung, extending from the intestinal termination of the duct clear across the pancreas, the head being near the periphery. He also showed two appendices, containing 2 and 3 specimens of the same worm, sent in by Dr. Kerr from the same place.

Dr. Ransom presented pictures of a worm sent in by Dr. Darling from the Canal Zone and said to have been collected from the urine of man. The worm is a specimen of *Mononchus*, a free-living genus, and the case is therefore one of pseudo-parasitism. The tooth in the buccal capsule would suggest a true parasite to most observers.

Dr. Ransom noted that numerous cases of *Cysticercus bovis* had recently been detected in abattoir inspection, 15 cases having been found in two days at Omaha. The parasite has also been rather common at Chicago, Kansas City, Milwaukee, Buffalo, etc. Up to a year ago, more specimens of *Cysticercus cellulosæ* had been found than of *C. bovis*, due probably to the fact that the former were more carefully looked for.

Dr. Stiles noted that Dr. Francis had recently sent him several cases of *C. cellulosæ* from Texas with the statement that this parasite was not uncommon in Texas.

Dr. Stiles presented a note on the preliminary survey of Texas for hookworm. He spent one month there, working at the state university, the normal school and the schools for the blind and the deaf and dumb, and in the open country. He demonstrated hookworm by microscopic findings in 45 counties and saw undoubted physical cases in another county. The disease occurs chiefly in the eastern portion of the state, and is probably unimportant in the northwest portion. In the rural eastern part, some places show about one third of the people infected. There are some severe cases, but none as bad as the worst cases in Alabama and Mississippi. A preliminary survey of the coal-mining part of West Virginia was interrupted after the hookworm had been microscopically determined in nine localities.

The rest of the evening was devoted to a talk by Dr. Stiles on "Foreign Parasitologists and Their Work."

THE ninth regular meeting of the society was held in the rooms of the Zoology Division of the Marine Hospital Service, 25th and E Streets, N.W., February 16, 1912, the president, Dr. Stiles, acting as host and chairman.

Dr. Stiles presented a number of generic names of parasites of man for consideration by the society. The society agreed to recommend to the International Committee on Nomenclature and to the Committee on Medical Zoology for adoption according to the plan agreed upon at the last Zoological Convention at Gratz, the following names:

Cestoda: *Davainea, Diplogonoporus, Dipylidium, Echinococcus, Tænia.*
Nematoda: *Ancylostoma, Ascaris, Dracunculus, Gnathostoma, Necator, Strongyloides, Trichostrongylus.*
Acanthocephala: *Gigantorhynchus.*
Gordiacea: *Gordius, Paragordius.*

Dr. Stiles presented a report on the work of the Rockefeller Hookworm Commission, and in this connection noted the compilation of the nomenclature used throughout the world in connection with hookworm disease. He also noted that the name *Necator africanus* given by Looss to a hookworm from the chimpanzee was preoccupied and that he had written to Looss asking him to change it.

Dr. Stiles also presented the outline of a symposium on amebiasis, which is to be part of the program at the coming International Congress of Hygiene and Demography.

Mr. Hall presented the following note:

*A Second Case of Multiceps multiceps in the Coyote.*

At the meeting of the society in April, 1911, the writer presented a note on a case of *Multiceps multiceps* in the coyote, *Canis nebracensis.* This was a case of infection by artificial feeding with *cœnurus,* the coyote dying six days later of septicæmia. Fifty-two heads of *M. multiceps* were recovered from the intestine. I wish to record a similar case from a coyote in the same litter, fed at the same time. Death occurred 14 days after feeding, and in the writer's absence the postmortem was made by Dr. Graybill, who found 4 heads of *M. multiceps* in the intestine. A comparison of these heads with the 52 recovered from the first coyote shows that apparently they had not developed any more in 14 days than in 6 days. In this connection may be mentioned a note presented before the society at the meeting in January, 1911, in which a case was noted where a dog fed *cœnurus* 82 days previously was found on postmortem to have 5 tapeworms, the largest having eggs with undeveloped onchospheres and the smallest being less than one half inch in length.

These data indicate that this worm may at times develop very slowly. Leuckart (1886) has noted that of three dogs fed *Cœnurus,* one was found to have over 100 completely developed tapeworms in about ten days; another had only heads of tapeworms after three weeks, with bands of segments an inch long attached to them in a few cases only, while the third failed to develop any tapeworms.

The remainder of the evening was devoted to a discussion of the nomenclature of parasitic diseases.

Maurice C. Hall,
*Secretary*

THE ACADEMY OF SCIENCE OF ST. LOUIS

The meeting of the Academy of Science of St. Louis was held at the Academy Building, Monday, February 19, 1912, at 8 P.M., President Engler in the chair.

Dr. Charles H. Turner presented a paper on "Experimental Study of Color Vision and Pattern Vision of Bees." The conclusion reached by experiments was that bees can distinguish, not only between colors, but also between color-patterns, and that this behavior is of value to them in recognizing plants that contain an abundant supply of honey. Hence, since bees can distinguish colors and the fine details of color-pattern, there is nothing about the visual powers of bees that militates against the theory that the colors and the color-patterns of flowers are adaptations to insect visitors. The bees respond to these colors, not because they prefer one color to another; but, because, under certain conditions the color or color-pattern selected has acquired a utilitarian meaning—has come to be the sign of something worth a response.

Although Plateau's conclusions do not harmonize with the above statement, yet the actual facts observed by him are in perfect accord.

Dr. H. M. Welpley spoke on "Miniature Indian Baskets" and exhibited two specimens made by the Pomo Indians which were viewed by means of simple microscopes. The foundation of the baskets is from the white leaf willow (*Salix argyrophylla*) and is sewed with California sedge (*Carex barbaræ*). The baskets are made in pattern black and white, the black being from the root of the California sedge. The larger basket is .18 × .10 inch, with the opening .06 inch across, and weighs one fourth grain. The smaller basket is .10 × .04 inch, with an opening .04 of an inch across, and weighs one twentieth grain. Both baskets are woven in the same manner as large baskets and carefully patterned. The Pomo Indians, located in northern central California, are noted for their basketry, which is unrivaled in North America, for workmanship, beauty and variety of designs. The women are the weavers, but the smaller basket was made by a man who is one of the few men weavers among the Pomo Indians.

George T. Moore,
*Corresponding Secretary*